FIG. 1

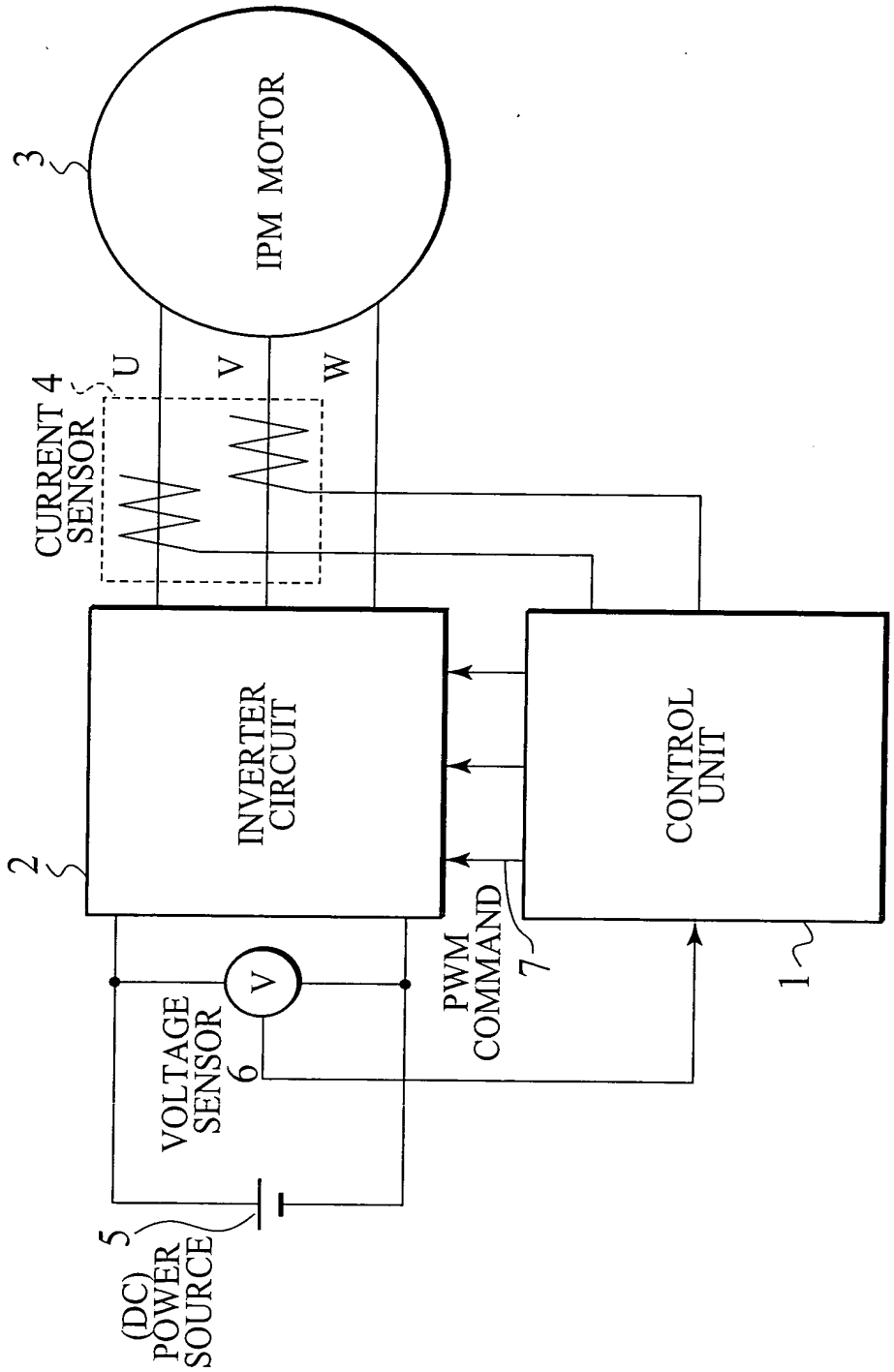

3
IPM MOTOR
CURRENT 4
SENSOR
U
V
W
2
INVERTER
CIRCUIT
CONTROL
UNIT
PWM
COMMAND
7
1
V
VOLTAGE
SENSOR
6
5
(DC)
POWER
SOURCE

FIG. 2

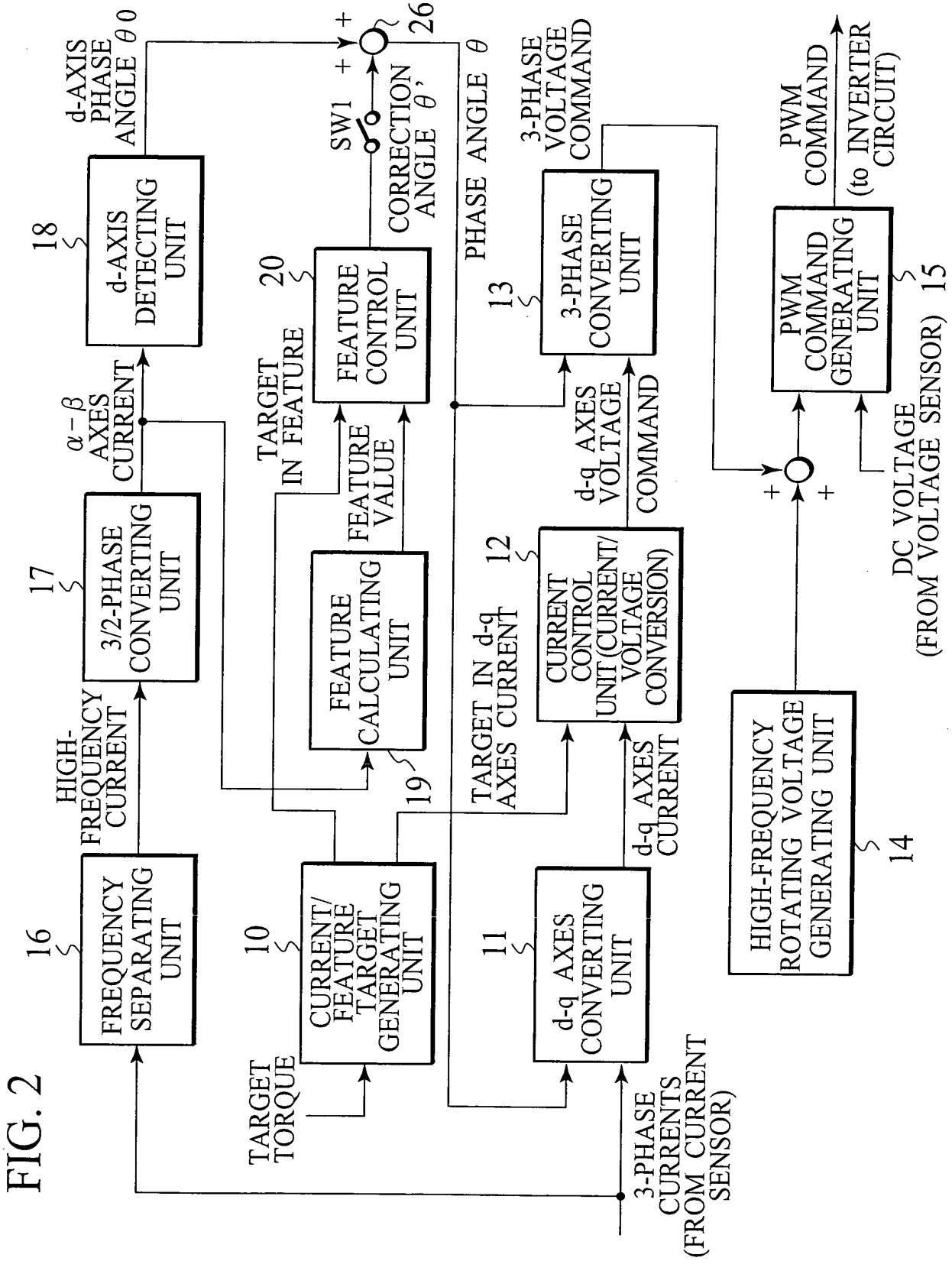

16
FREQUENCY SEPARATING UNIT
HIGH-FREQUENCY CURRENT
17
3/2-PHASE CONVERTING UNIT
α-β AXES CURRENT
18
d-AXIS DETECTING UNIT
d-AXIS PHASE ANGLE θ0
10
CURRENT/ FEATURE TARGET GENERATING UNIT
TARGET TORQUE
19
FEATURE CALCULATING UNIT
FEATURE VALUE
20
FEATURE CONTROL UNIT
TARGET IN FEATURE
SW1
+
+
26
CORRECTION ANGLE θ'
PHASE ANGLE θ
11
d-q AXES CONVERTING UNIT
3-PHASE CURRENTS (FROM CURRENT SENSOR)
d-q AXES CURRENT
12
CURRENT CONTROL UNIT (CURRENT/ VOLTAGE CONVERSION)
TARGET IN d-q AXES CURRENT
d-q AXES VOLTAGE COMMAND
13
3-PHASE CONVERTING UNIT
3-PHASE VOLTAGE COMMAND
14
HIGH-FREQUENCY ROTATING VOLTAGE GENERATING UNIT
15
PWM COMMAND GENERATING UNIT
PWM COMMAND (to INVERTER CIRCUIT)
DC VOLTAGE (FROM VOLTAGE SENSOR)

FIG. 3A

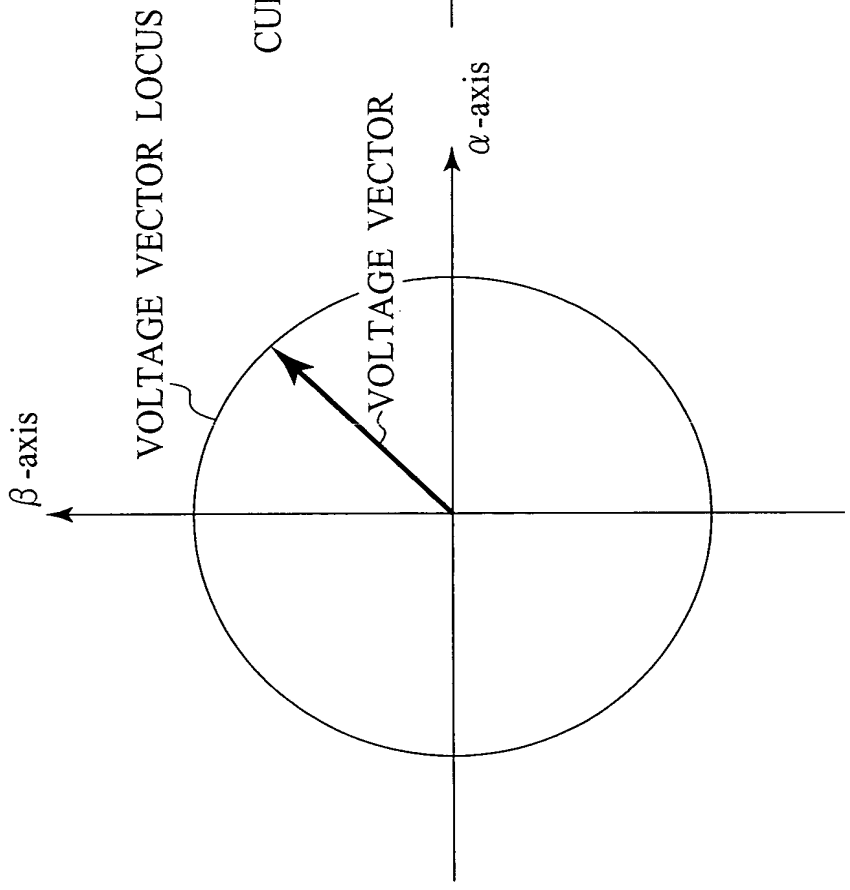

VOLTAGE VECTOR LOCUS
β-axis
VOLTAGE VECTOR
α-axis

FIG. 3B

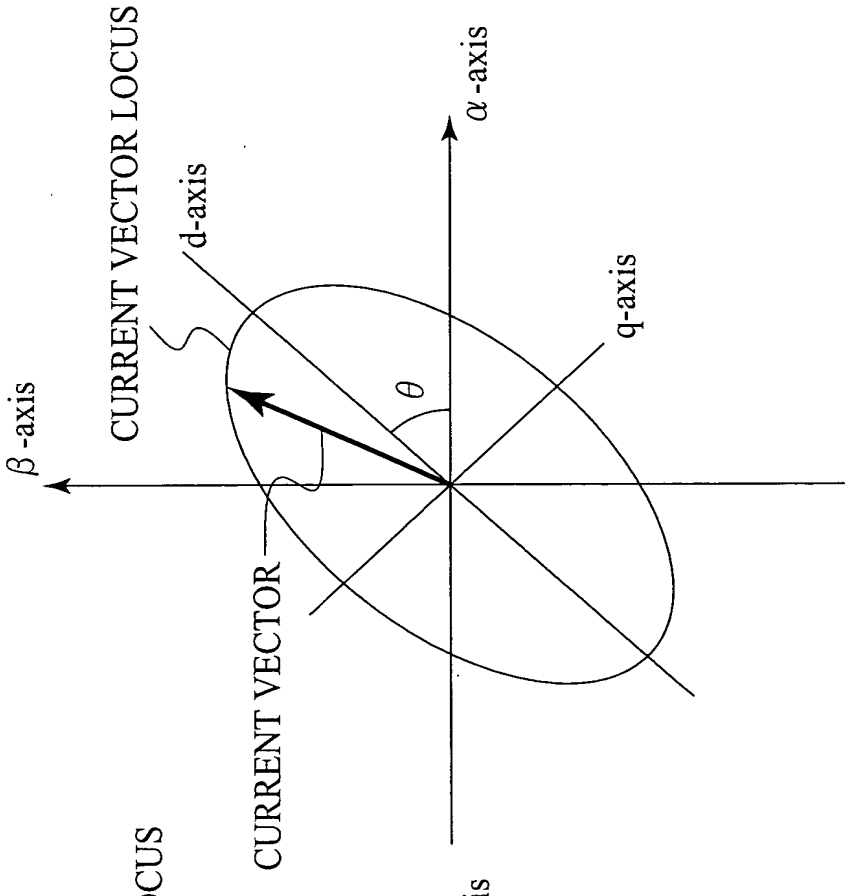

CURRENT VECTOR LOCUS
β-axis
d-axis
α-axis
q-axis
θ
CURRENT VECTOR

FIG. 4A

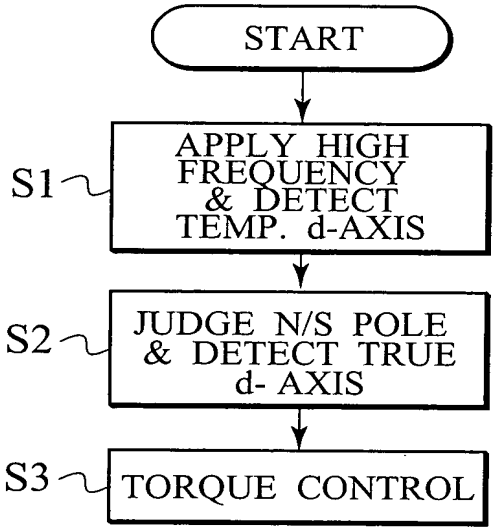

START
S1
APPLY HIGH FREQUENCY & DETECT TEMP. d-AXIS
S2
JUDGE N/S POLE & DETECT TRUE d- AXIS
S3
TORQUE CONTROL

FIG. 4B

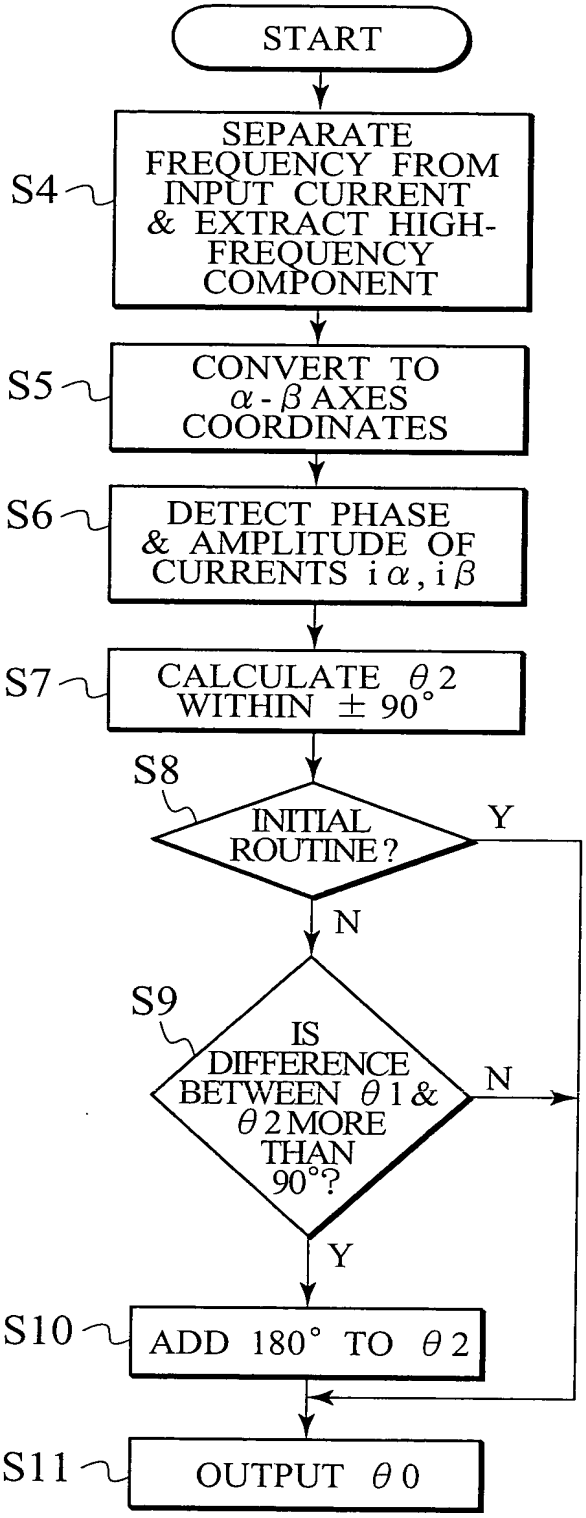

START
S4
SEPARATE FREQUENCY FROM INPUT CURRENT & EXTRACT HIGH-FREQUENCY COMPONENT
S5
CONVERT TO α-β AXES COORDINATES
S6
DETECT PHASE & AMPLITUDE OF CURRENTS iα, iβ
S7
CALCULATE θ2 WITHIN ± 90°
S8
INITIAL ROUTINE?
Y
N
S9
IS DIFFERENCE BETWEEN θ1 & θ2 MORE THAN 90°?
N
Y
S10
ADD 180° TO θ2
S11
OUTPUT θ0

FIG. 5

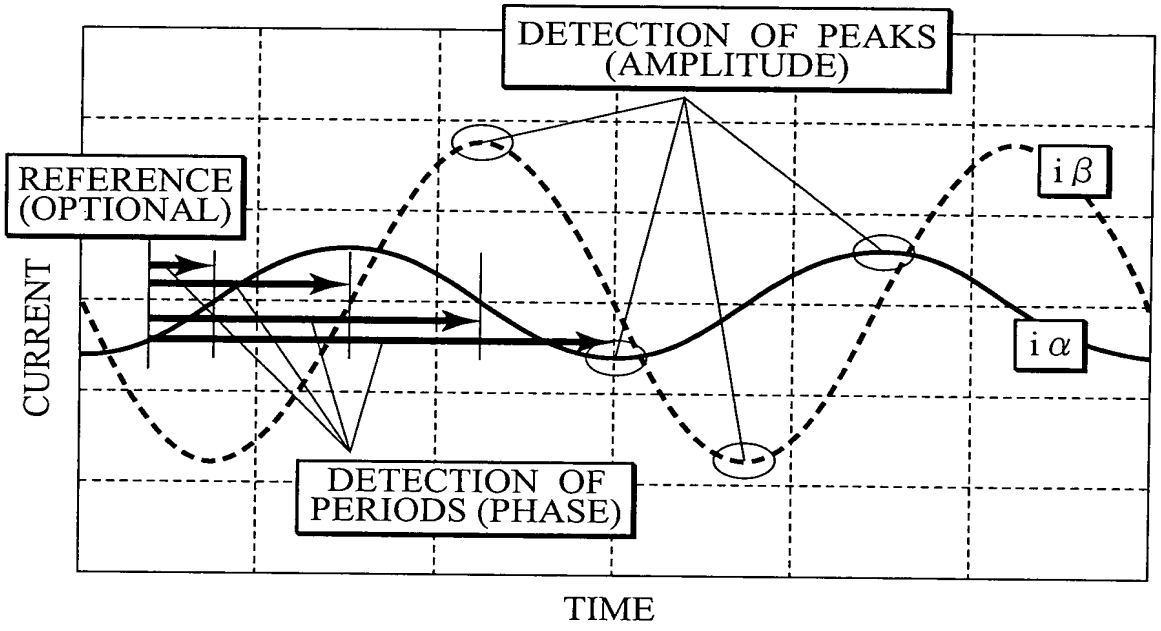

DETECTION OF PEAKS
(AMPLITUDE)
REFERENCE
(OPTIONAL)
iβ
iα
CURRENT
DETECTION OF
PERIODS (PHASE)
TIME

FIG. 6

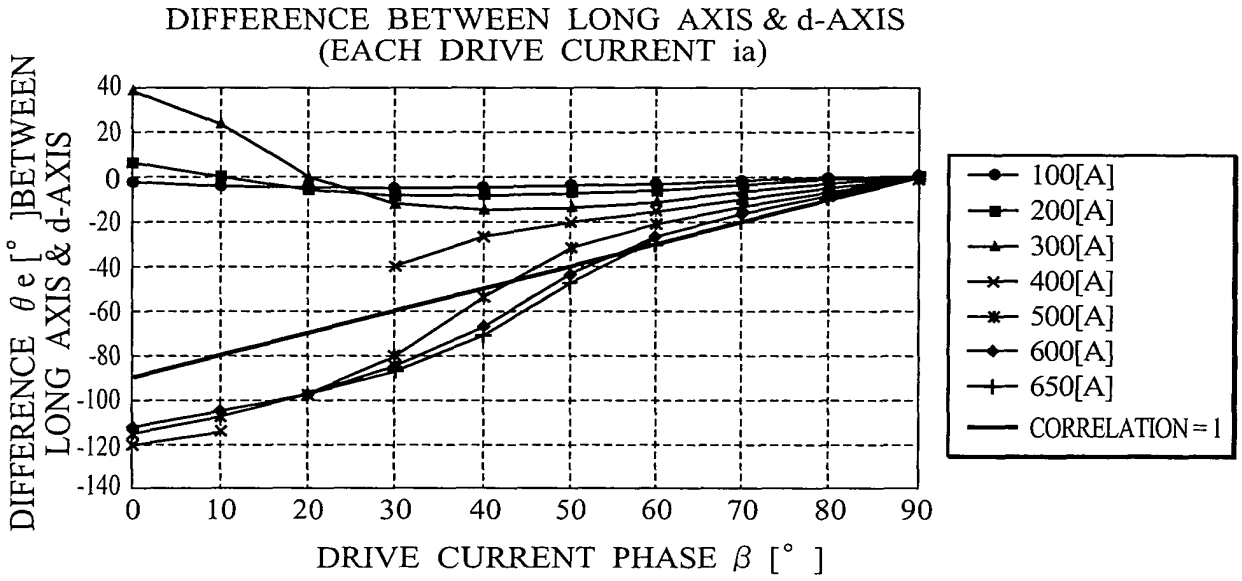

DIFFERENCE BETWEEN LONG AXIS & d-AXIS
(EACH DRIVE CURRENT ia)
DIFFERENCE θe [°]BETWEEN LONG AXIS & d-AXIS
40
20
0
-20
-40
-60
-80
-100
-120
-140
0
10
20
30
40
50
60
70
80
90
DRIVE CURRENT PHASE β [°]
100[A]
200[A]
300[A]
400[A]
500[A]
600[A]
650[A]
CORRELATION = 1

FIG. 7

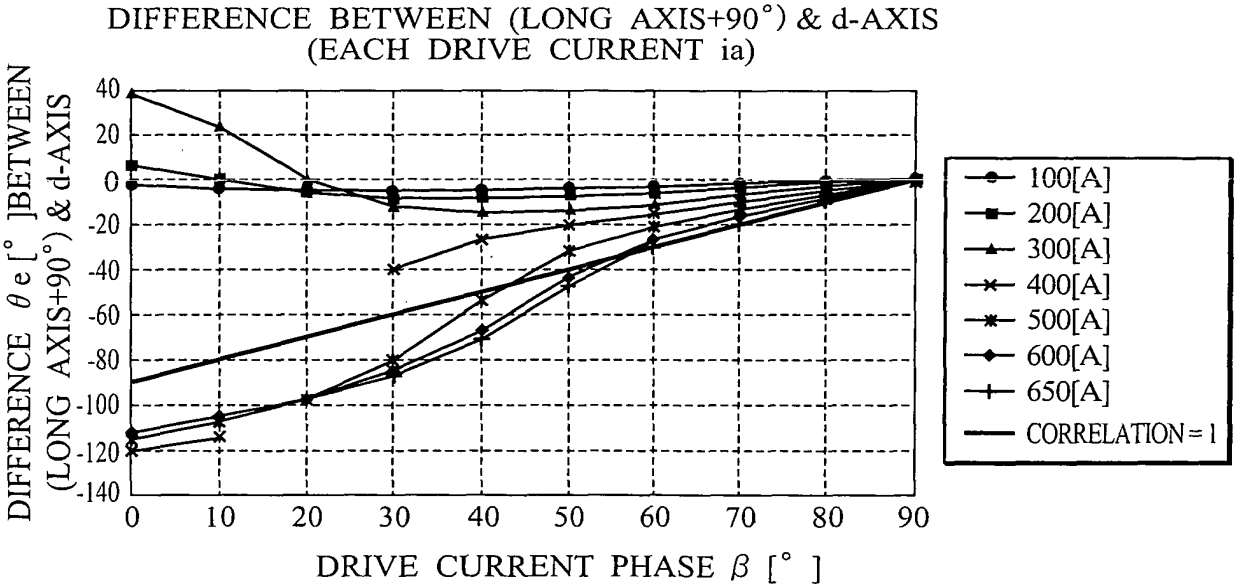

DIFFERENCE BETWEEN (LONG AXIS+90°) & d-AXIS
(EACH DRIVE CURRENT ia)
DIFFERENCE θe [°]BETWEEN (LONG AXIS+90°) & d-AXIS
40
20
0
-20
-40
-60
-80
-100
-120
-140
0
10
20
30
40
50
60
70
80
90
DRIVE CURRENT PHASE β [°]
100[A]
200[A]
300[A]
400[A]
500[A]
600[A]
650[A]
CORRELATION = 1

FIG. 8

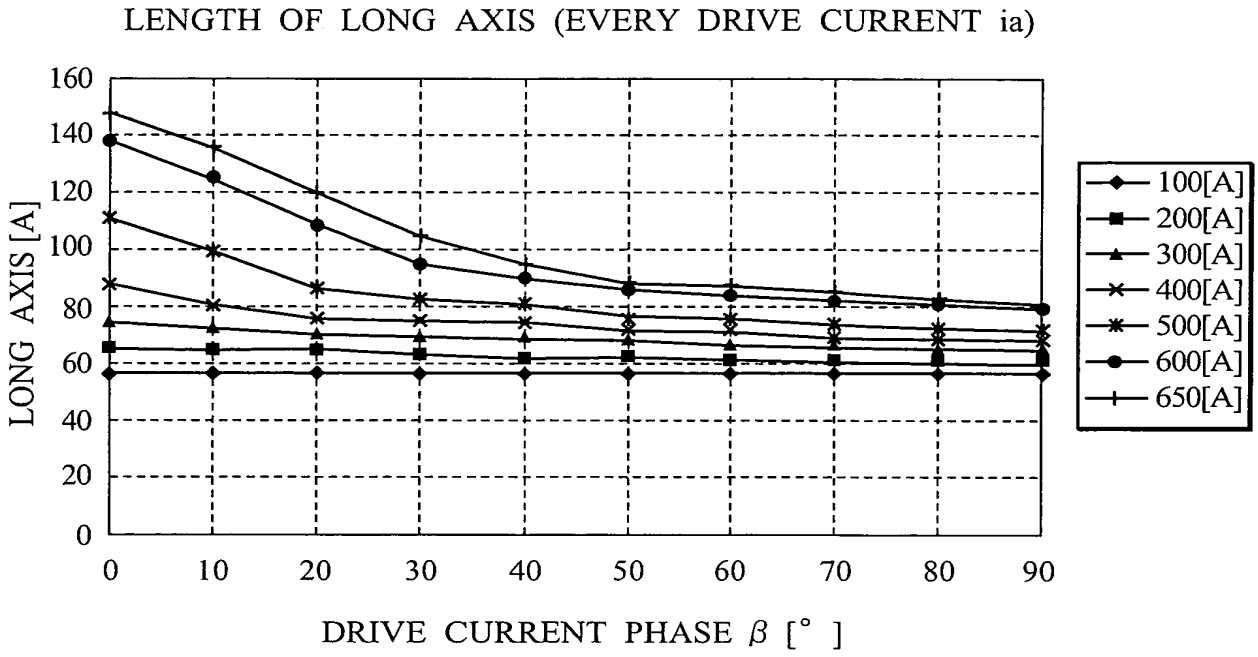

LENGTH OF LONG AXIS (EVERY DRIVE CURRENT ia)
LONG AXIS [A]
160
140
120
100
80
60
40
20
0
0
10
20
30
40
50
60
70
80
90
DRIVE CURRENT PHASE β [°]
100[A]
200[A]
300[A]
400[A]
500[A]
600[A]
650[A]

FIG. 9

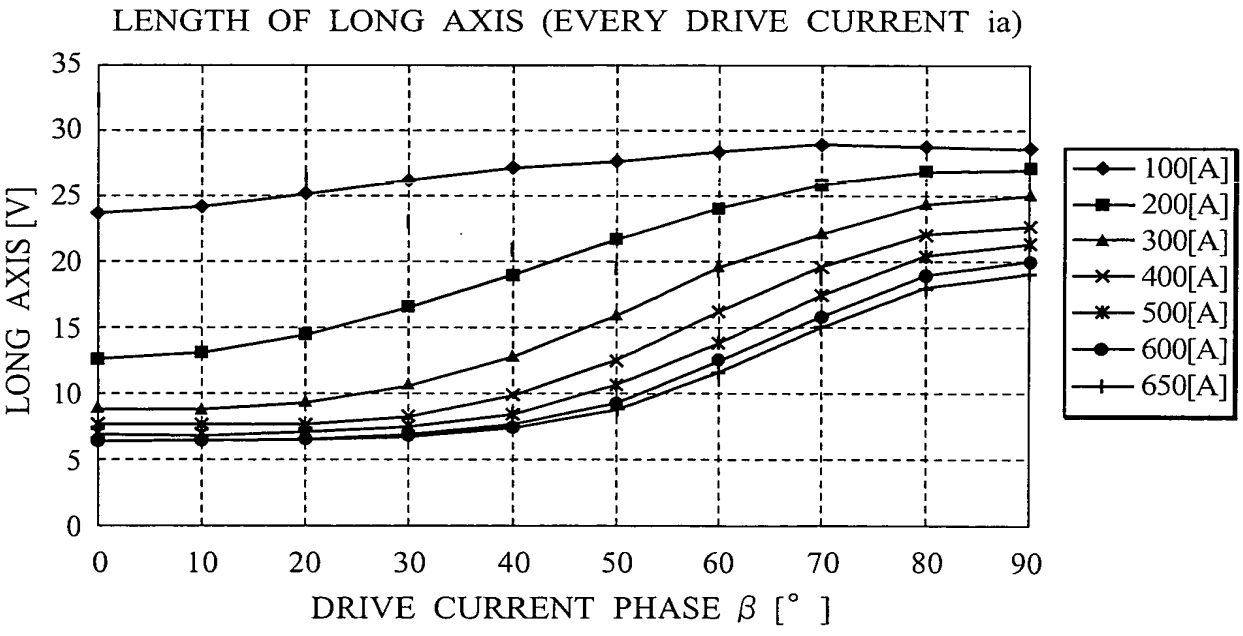

LENGTH OF LONG AXIS (EVERY DRIVE CURRENT ia)
LONG AXIS [V]
35
30
25
20
15
10
5
0
0
10
20
30
40
50
60
70
80
90
DRIVE CURRENT PHASE β [°]
100[A]
200[A]
300[A]
400[A]
500[A]
600[A]
650[A]

FIG. 10

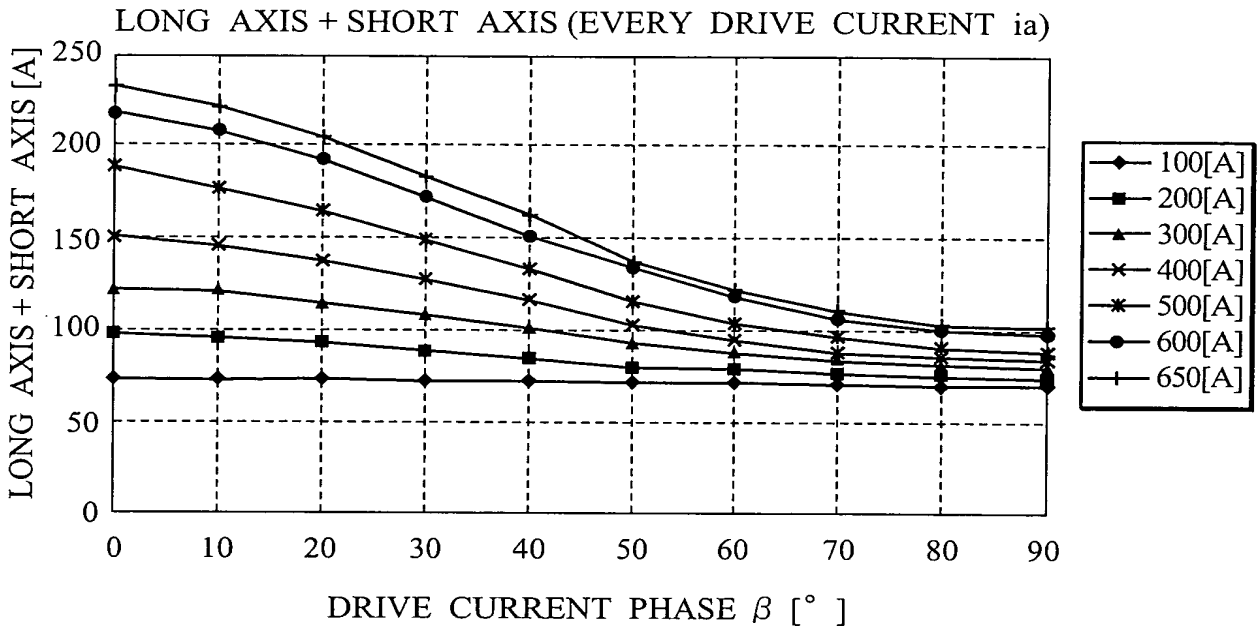

LONG AXIS + SHORT AXIS (EVERY DRIVE CURRENT ia)
LONG AXIS + SHORT AXIS [A]
250
200
150
100
50
0
0
10
20
30
40
50
60
70
80
90
DRIVE CURRENT PHASE β [°]
100[A]
200[A]
300[A]
400[A]
500[A]
600[A]
650[A]

FIG. 11

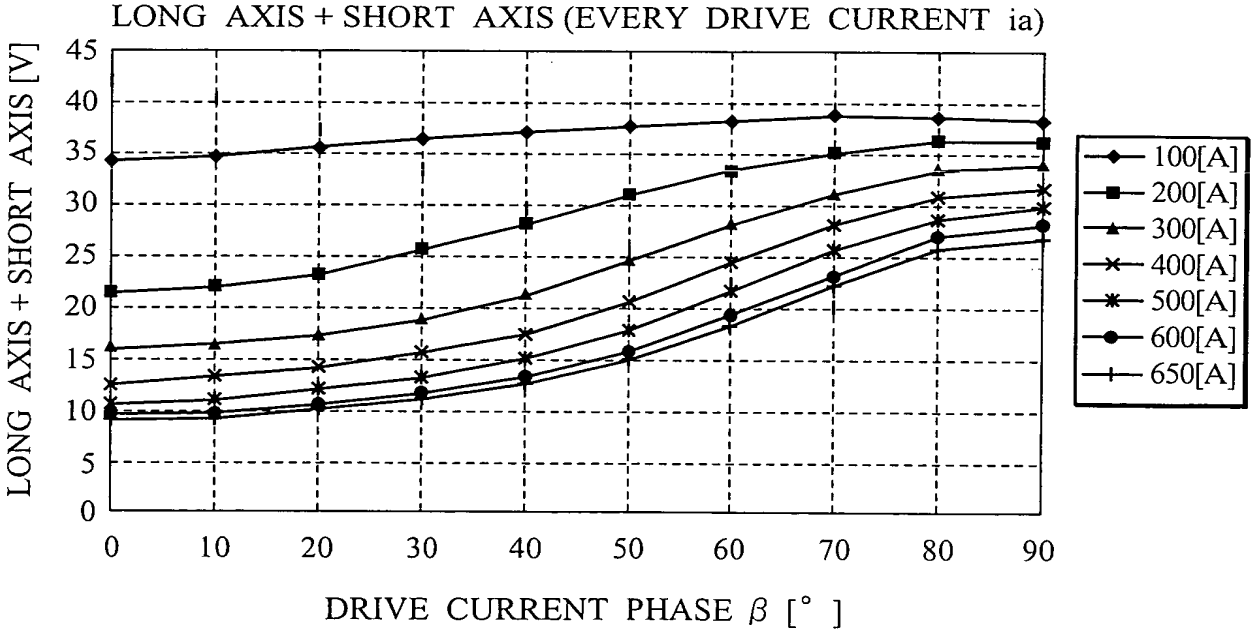

LONG AXIS + SHORT AXIS (EVERY DRIVE CURRENT ia)
LONG AXIS + SHORT AXIS [V]
45
40
35
30
25
20
15
10
5
0
0
10
20
30
40
50
60
70
80
90
DRIVE CURRENT PHASE β [°]
100[A]
200[A]
300[A]
400[A]
500[A]
600[A]
650[A]

FIG. 12

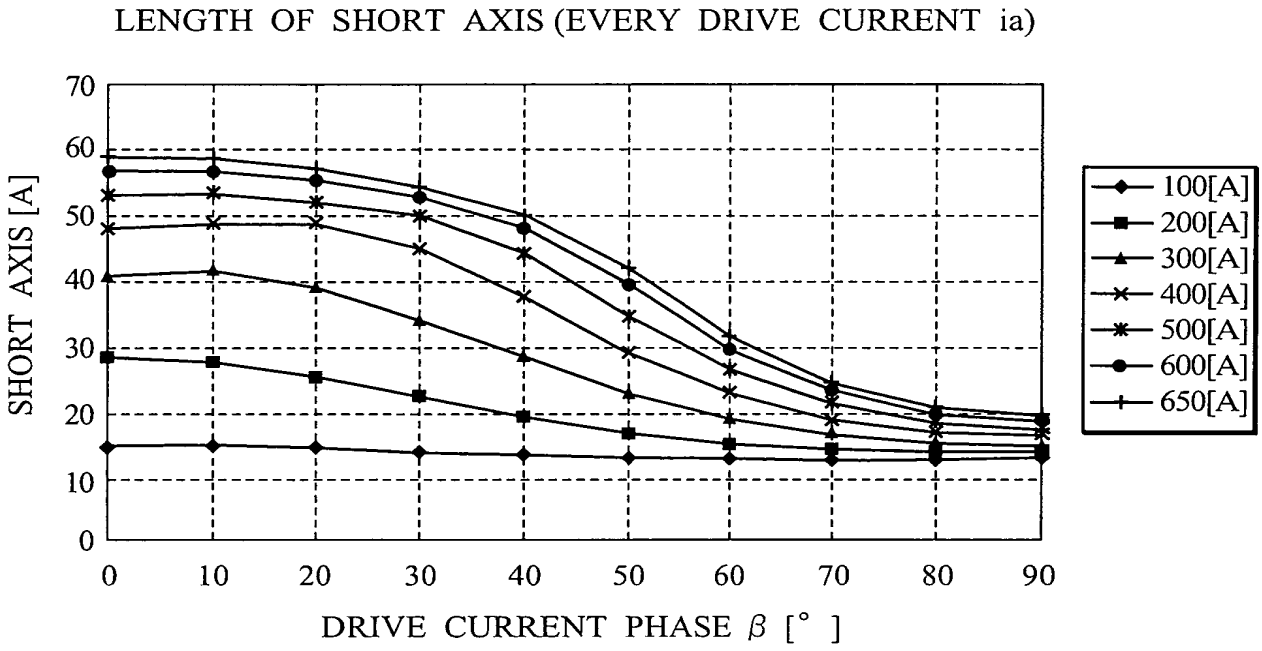

LENGTH OF SHORT AXIS (EVERY DRIVE CURRENT ia)
SHORT AXIS [A]
70
60
50
40
30
20
10
0
0
10
20
30
40
50
60
70
80
90
DRIVE CURRENT PHASE β [°]
100[A]
200[A]
300[A]
400[A]
500[A]
600[A]
650[A]

FIG. 13

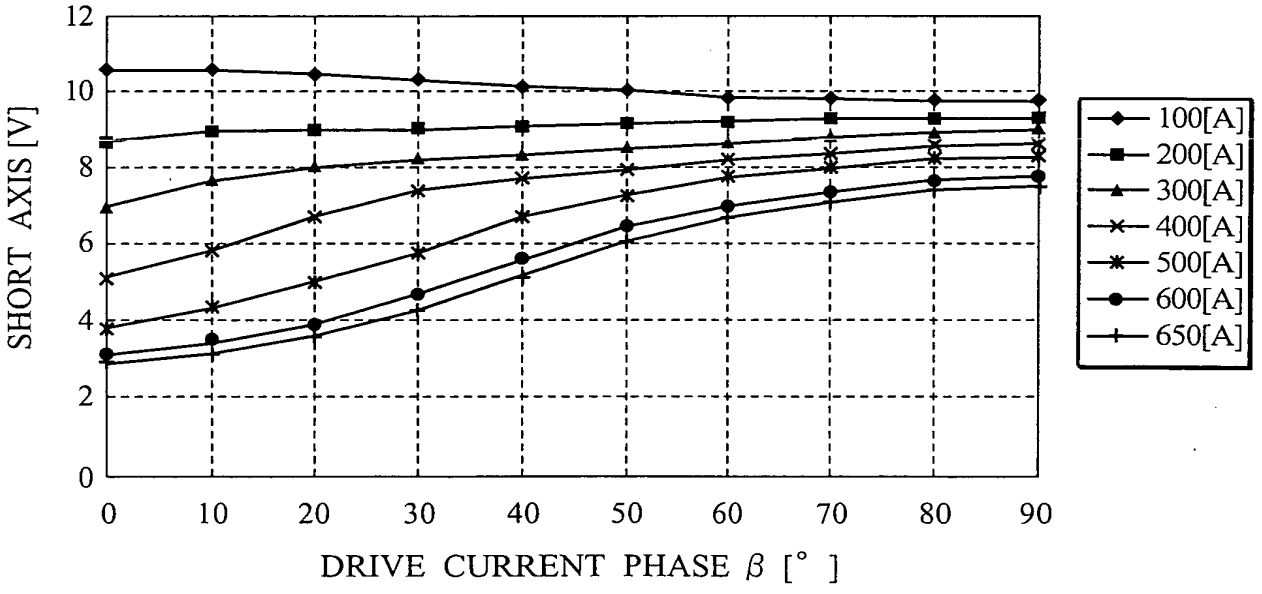

LENGTH OF SHORT AXIS (EVERY DRIVE CURRENT ia)
SHORT AXIS [V]
12
10
8
6
4
2
0
0
10
20
30
40
50
60
70
80
90
DRIVE CURRENT PHASE β [°]
100[A]
200[A]
300[A]
400[A]
500[A]
600[A]
650[A]

FIG. 14

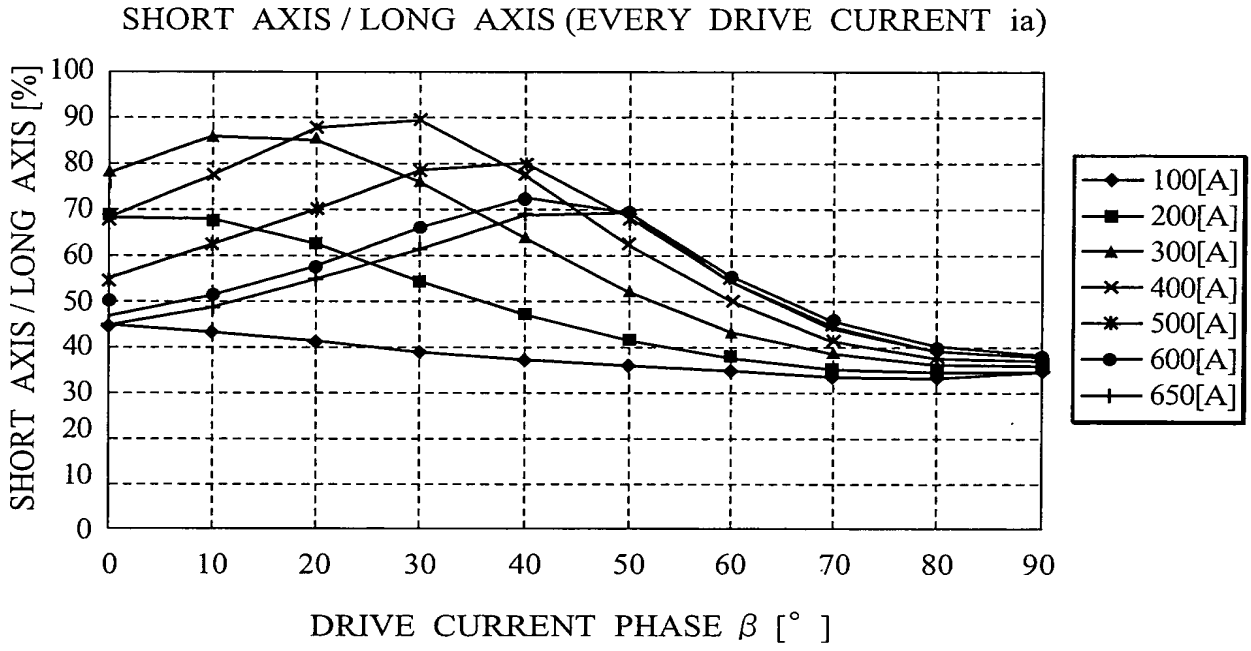

SHORT AXIS / LONG AXIS (EVERY DRIVE CURRENT ia)
SHORT AXIS / LONG AXIS [%]
100
90
80
70
60
50
40
30
20
10
0
0
10
20
30
40
50
60
70
80
90
DRIVE CURRENT PHASE β [°]
100[A]
200[A]
300[A]
400[A]
500[A]
600[A]
650[A]

FIG. 15

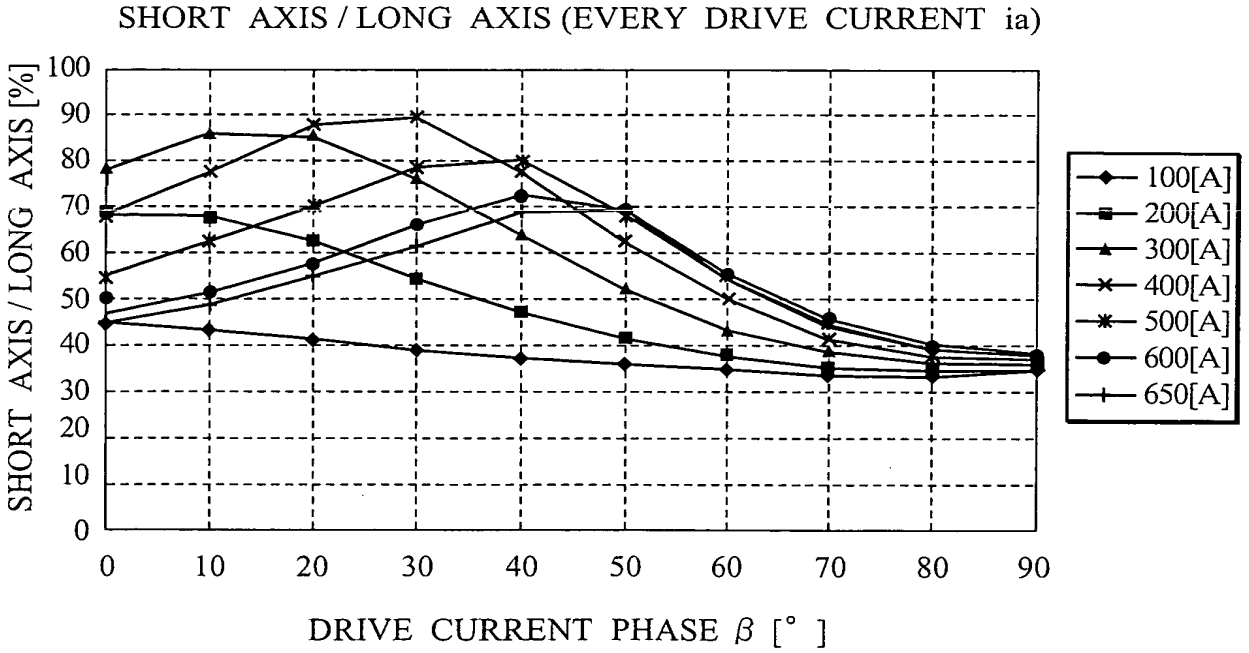

SHORT AXIS / LONG AXIS (EVERY DRIVE CURRENT ia)
SHORT AXIS / LONG AXIS [%]
100
90
80
70
60
50
40
30
20
10
0
0
10
20
30
40
50
60
70
80
90
DRIVE CURRENT PHASE β [°]
100[A]
200[A]
300[A]
400[A]
500[A]
600[A]
650[A]

FIG. 16

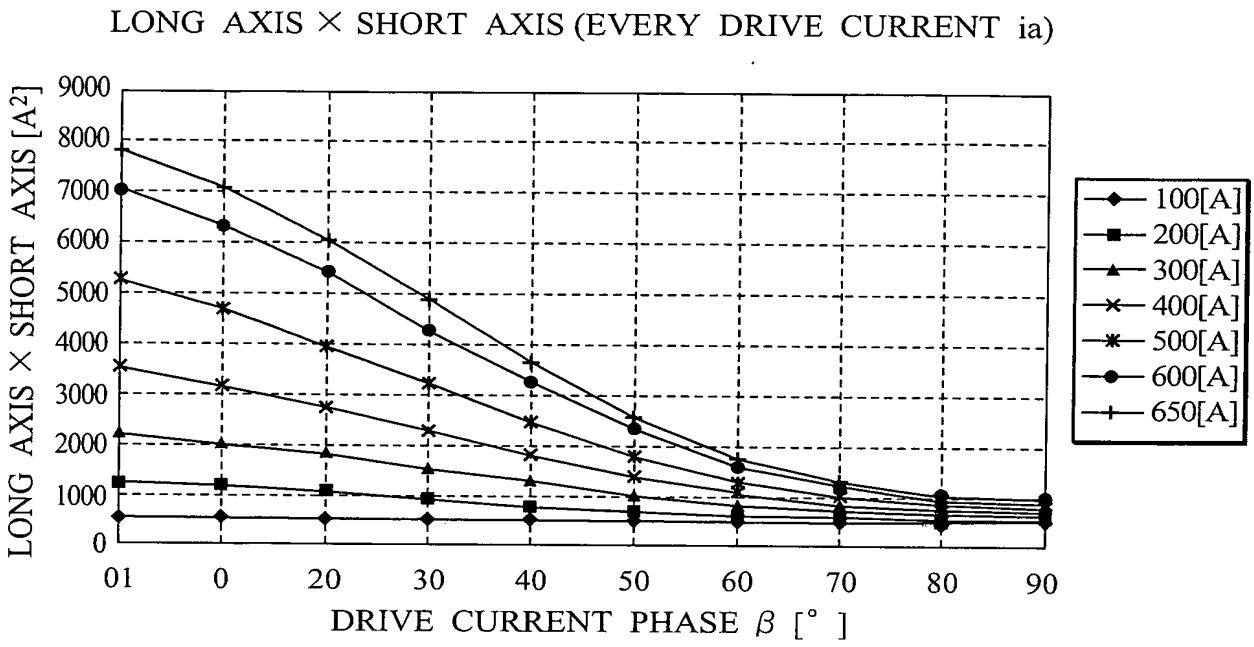

LONG AXIS × SHORT AXIS (EVERY DRIVE CURRENT ia)
LONG AXIS × SHORT AXIS [A²]
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
01
0
20
30
40
50
60
70
80
90
DRIVE CURRENT PHASE β [°]
100[A]
200[A]
300[A]
400[A]
500[A]
600[A]
650[A]

FIG. 17

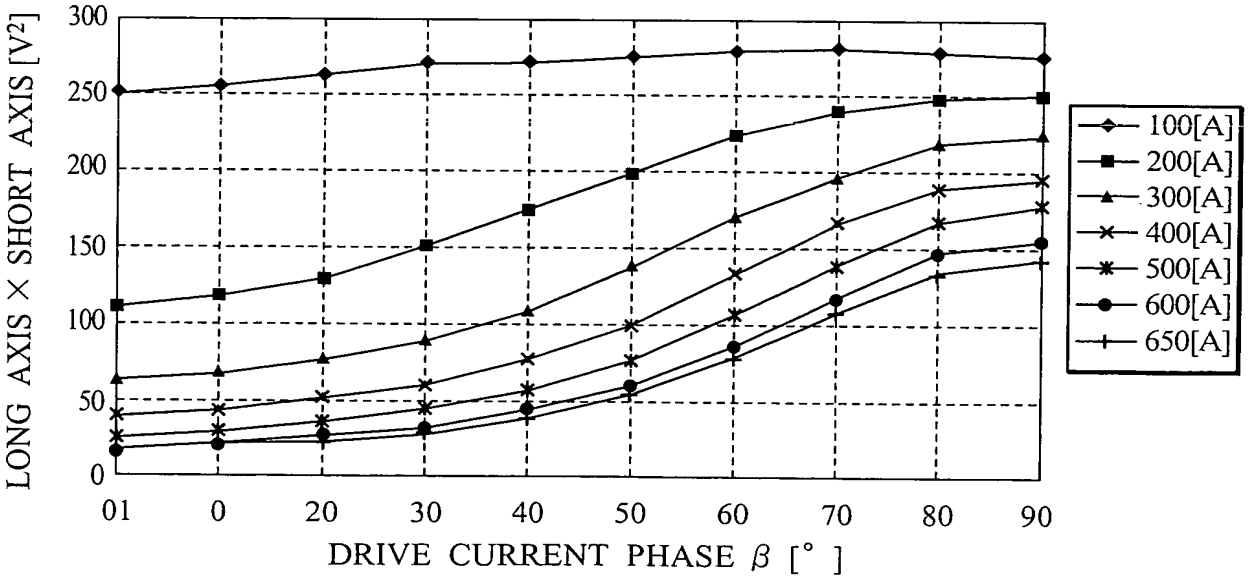

LONG AXIS × SHORT AXIS (EVERY DRIVE CURRENT ia)
LONG AXIS × SHORT AXIS [V²]
300
250
200
150
100
50
0
01
0
20
30
40
50
60
70
80
90
DRIVE CURRENT PHASE β [°]
100[A]
200[A]
300[A]
400[A]
500[A]
600[A]
650[A]

FIG. 18

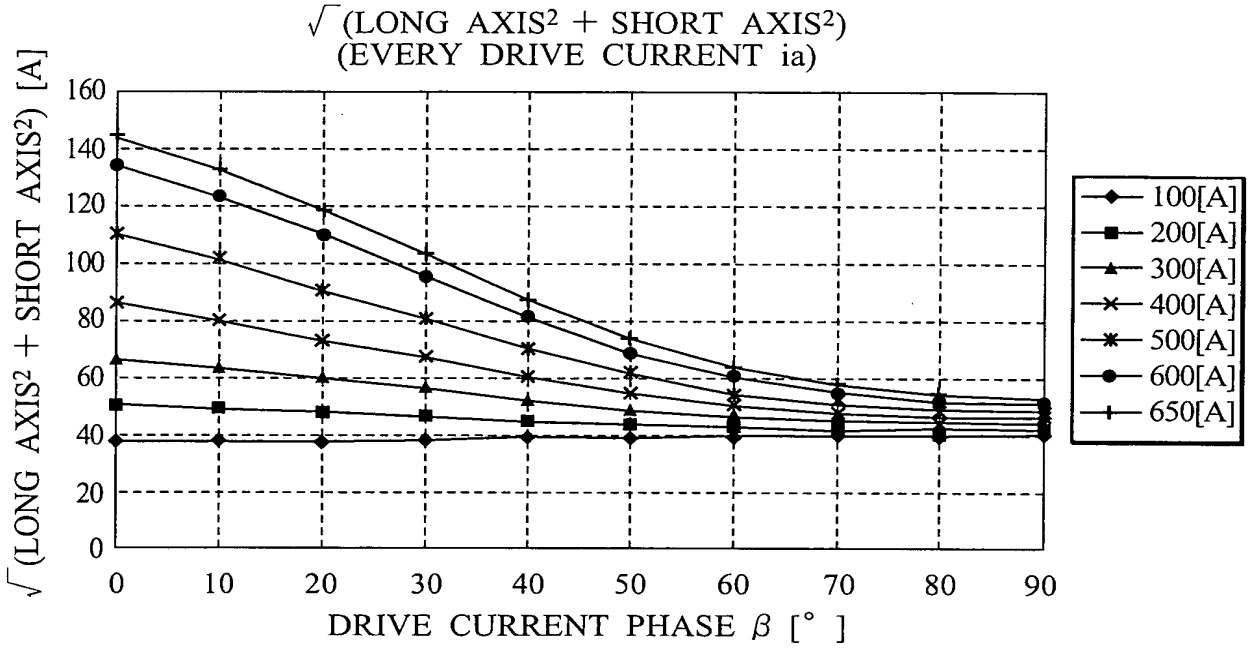

√(LONG AXIS² + SHORT AXIS²)
(EVERY DRIVE CURRENT ia)
√(LONG AXIS² + SHORT AXIS²) [A]
160
140
120
100
80
60
40
20
0
0
10
20
30
40
50
60
70
80
90
DRIVE CURRENT PHASE β [°]
100[A]
200[A]
300[A]
400[A]
500[A]
600[A]
650[A]

FIG. 19

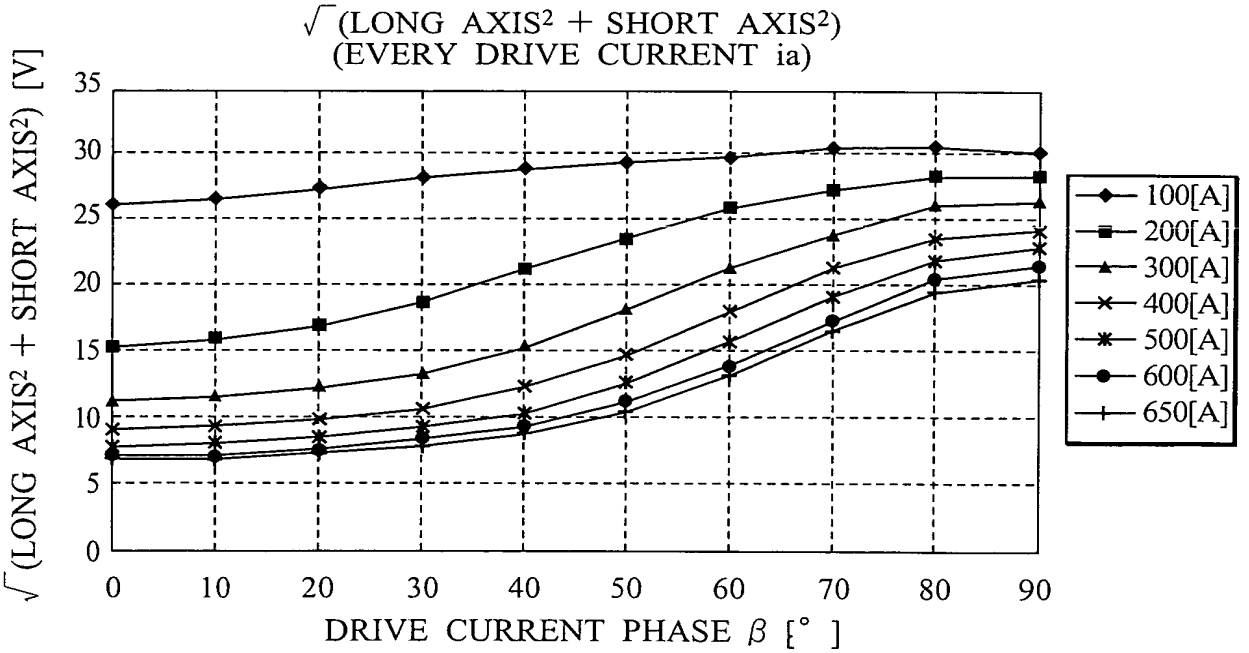

√(LONG AXIS² + SHORT AXIS²)
(EVERY DRIVE CURRENT ia)
√(LONG AXIS² + SHORT AXIS²) [V]
35
30
25
20
15
10
5
0
0
10
20
30
40
50
60
70
80
90
DRIVE CURRENT PHASE β [°]
100[A]
200[A]
300[A]
400[A]
500[A]
600[A]
650[A]

FIG. 20

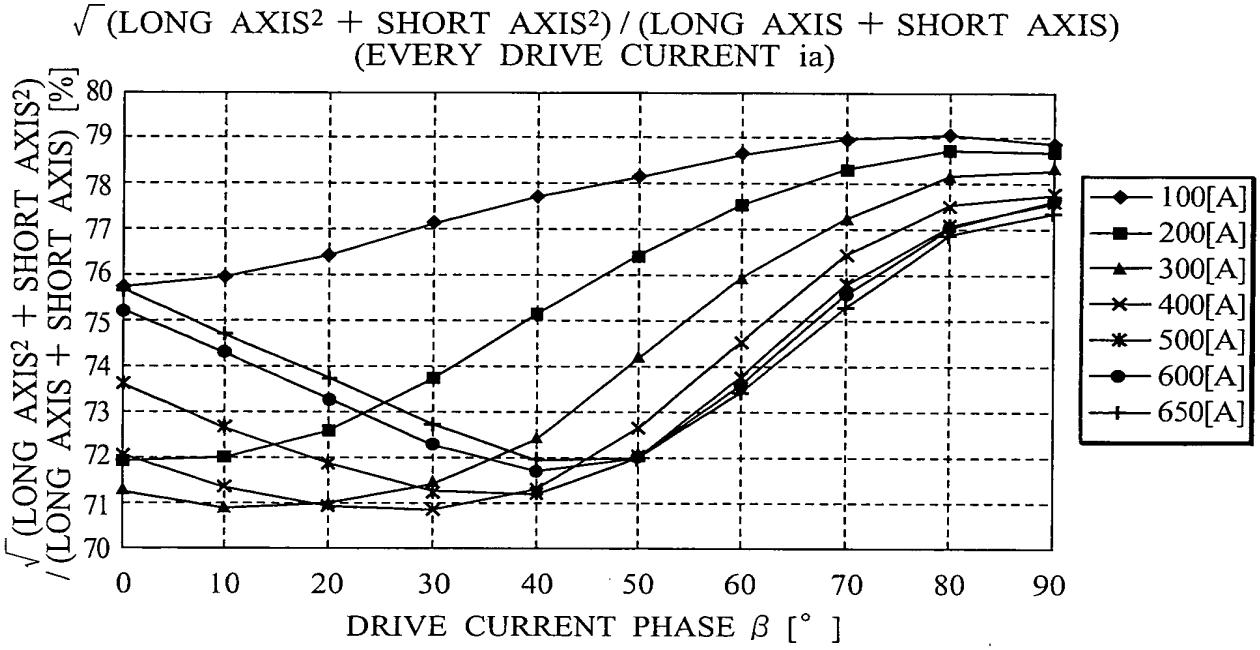

√(LONG AXIS² + SHORT AXIS²) / (LONG AXIS + SHORT AXIS)
(EVERY DRIVE CURRENT ia)
√(LONG AXIS² + SHORT AXIS²) / (LONG AXIS + SHORT AXIS) [%]
80
79
78
77
76
75
74
73
72
71
70
0
10
20
30
40
50
60
70
80
90
DRIVE CURRENT PHASE β [°]
100[A]
200[A]
300[A]
400[A]
500[A]
600[A]
650[A]

FIG. 21

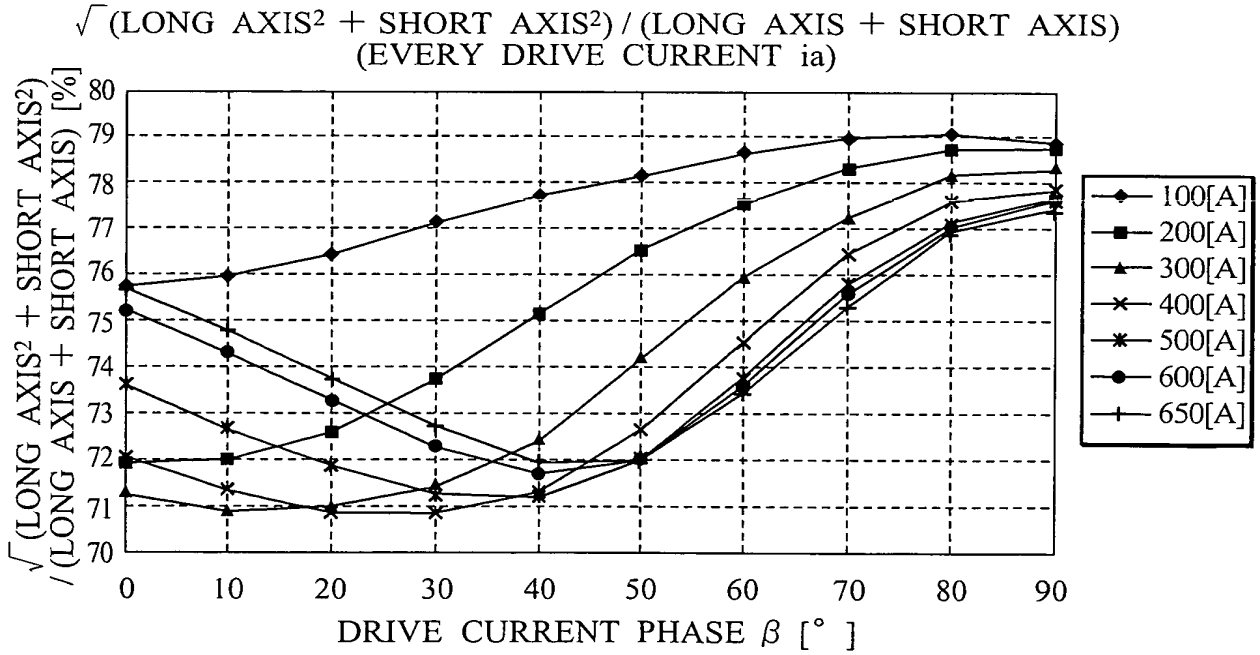

√(LONG AXIS² + SHORT AXIS²) / (LONG AXIS + SHORT AXIS)
(EVERY DRIVE CURRENT ia)
√(LONG AXIS² + SHORT AXIS²) / (LONG AXIS + SHORT AXIS) [%]
80
79
78
77
76
75
74
73
72
71
70
0
10
20
30
40
50
60
70
80
90
DRIVE CURRENT PHASE β [°]
100[A]
200[A]
300[A]
400[A]
500[A]
600[A]
650[A]

FIG. 22

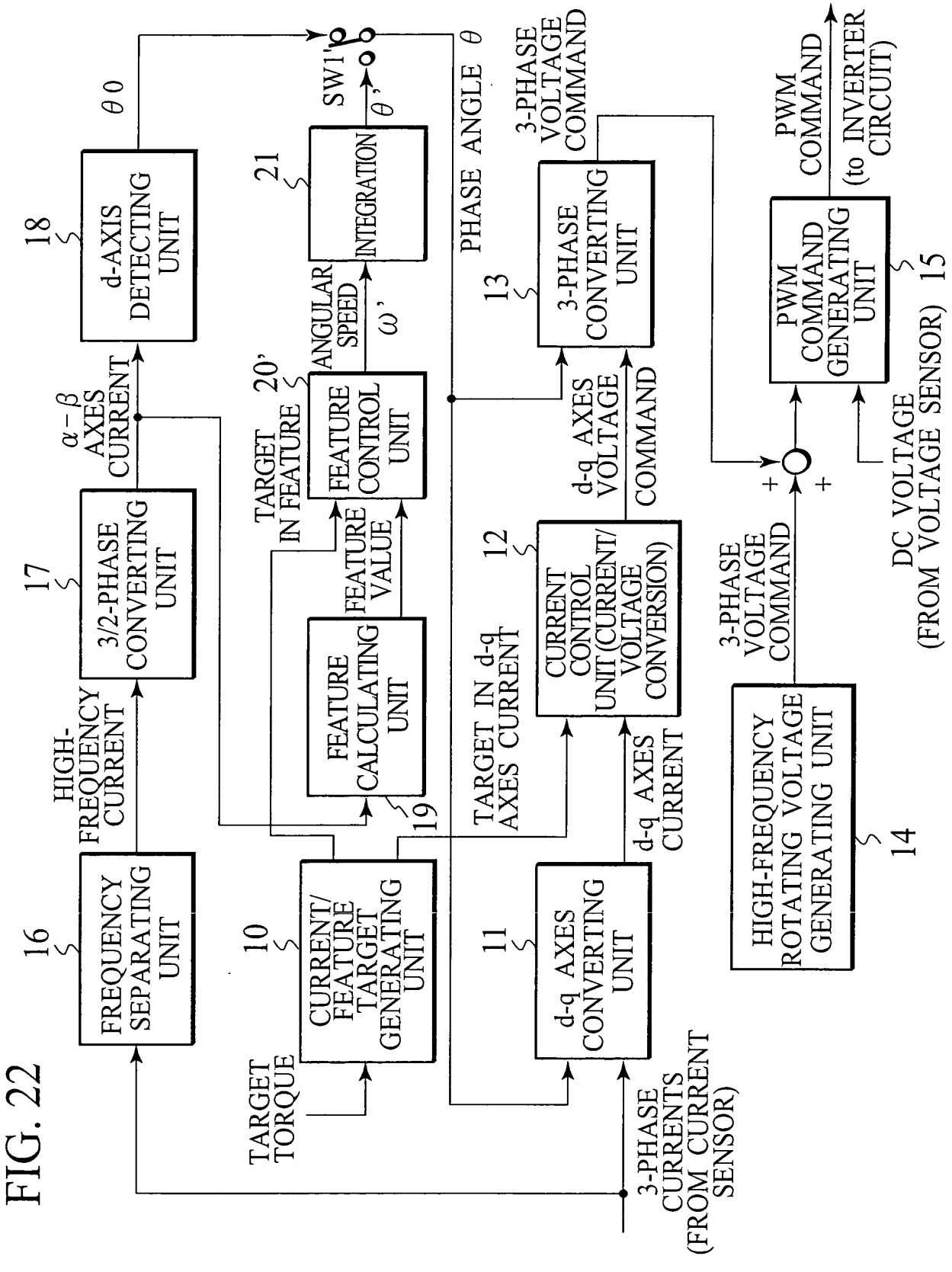

16
FREQUENCY SEPARATING UNIT
HIGH-FREQUENCY CURRENT
17
3/2-PHASE CONVERTING UNIT
α－β AXES CURRENT
18
d-AXIS DETECTING UNIT
θ 0
SW1'
θ'
21
INTEGRATION
ANGULAR SPEED
ω'
20'
FEATURE CONTROL UNIT
TARGET IN FEATURE
FEATURE VALUE
19
FEATURE CALCULATING UNIT
10
CURRENT/ FEATURE TARGET GENERATING UNIT
TARGET TORQUE
PHASE ANGLE θ
TARGET IN d-q AXES CURRENT
12
CURRENT CONTROL UNIT (CURRENT/ VOLTAGE CONVERSION)
d-q AXES VOLTAGE COMMAND
13
3-PHASE CONVERTING UNIT
3-PHASE VOLTAGE COMMAND
11
d-q AXES CONVERTING UNIT
d-q AXES CURRENT
3-PHASE CURRENTS (FROM CURRENT SENSOR)
HIGH-FREQUENCY ROTATING VOLTAGE GENERATING UNIT
14
3-PHASE VOLTAGE COMMAND
+
+
PWM COMMAND GENERATING UNIT
15
PWM COMMAND (to INVERTER CIRCUIT)
DC VOLTAGE (FROM VOLTAGE SENSOR)

FIG. 23

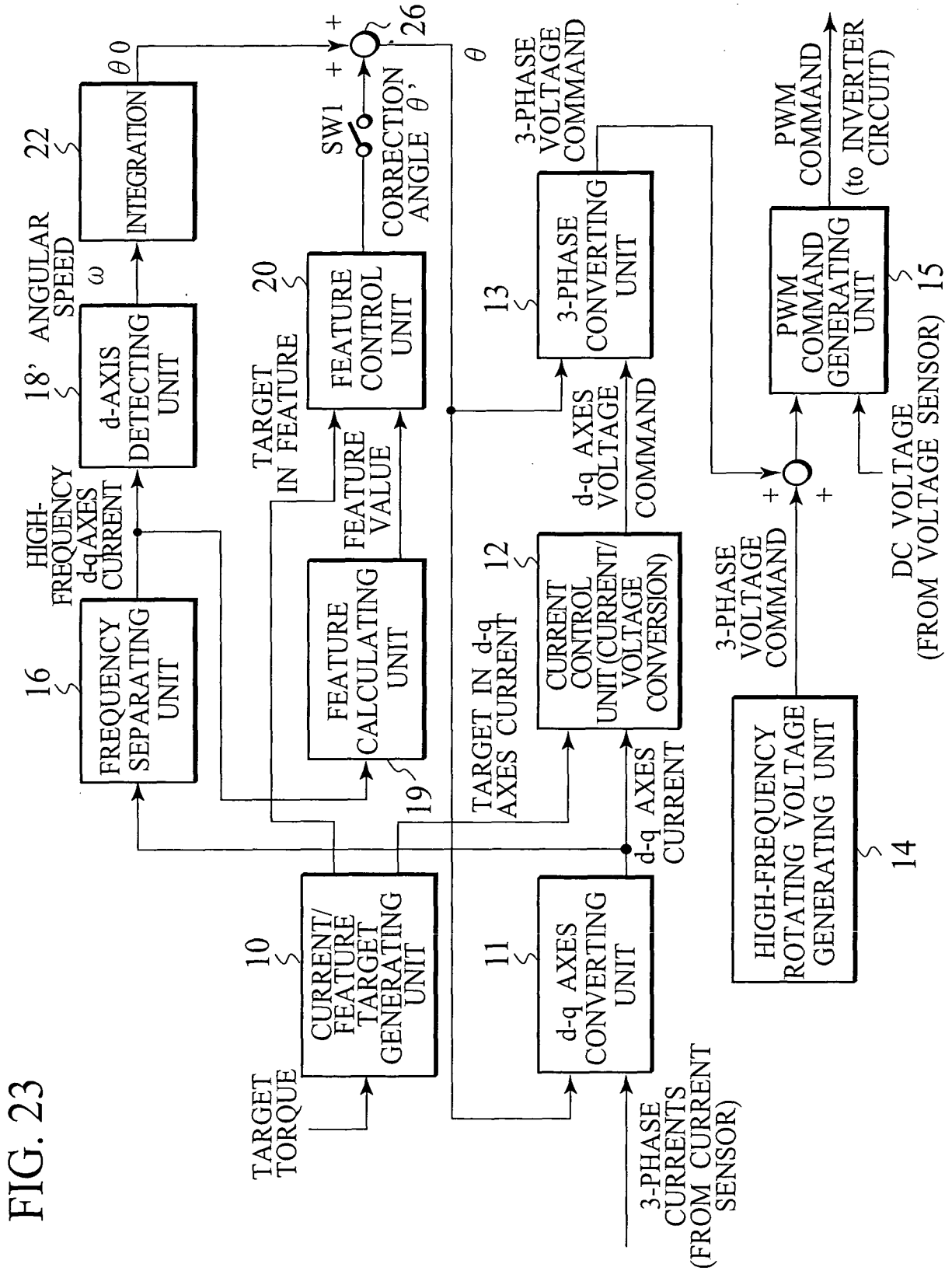

TARGET TORQUE
CURRENT/ FEATURE TARGET GENERATING UNIT
10
3-PHASE CURRENTS (FROM CURRENT SENSOR)
d-q AXES CONVERTING UNIT
11
TARGET IN d-q AXES CURRENT
d-q AXES CURRENT
CURRENT CONTROL UNIT (CURRENT/ VOLTAGE CONVERSION)
12
d-q AXES VOLTAGE COMMAND
3-PHASE CONVERTING UNIT
13
3-PHASE VOLTAGE COMMAND
HIGH-FREQUENCY ROTATING VOLTAGE GENERATING UNIT
14
3-PHASE VOLTAGE COMMAND
PWM COMMAND GENERATING UNIT
15
PWM COMMAND (to INVERTER CIRCUIT)
DC VOLTAGE (FROM VOLTAGE SENSOR)
16
FREQUENCY SEPARATING UNIT
HIGH-FREQUENCY d-q AXES CURRENT
d-AXIS DETECTING UNIT
18'
ANGULAR SPEED ω
INTEGRATION
22
θ 0
FEATURE CALCULATING UNIT
19
FEATURE VALUE
TARGET IN FEATURE
FEATURE CONTROL UNIT
20
CORRECTION ANGLE θ'
SW1
26
θ

FIG. 24

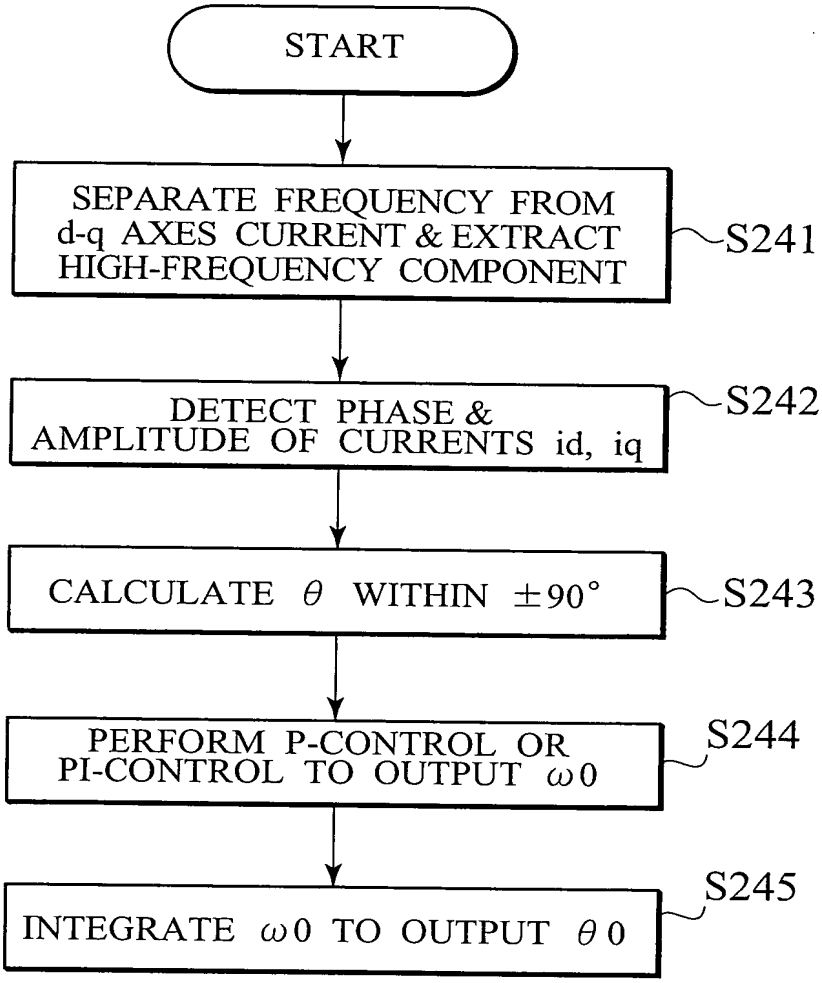

START
SEPARATE FREQUENCY FROM d-q AXES CURRENT & EXTRACT HIGH-FREQUENCY COMPONENT
S241
DETECT PHASE & AMPLITUDE OF CURRENTS id, iq
S242
CALCULATE θ WITHIN ±90°
S243
PERFORM P-CONTROL OR PI-CONTROL TO OUTPUT ω0
S244
INTEGRATE ω0 TO OUTPUT θ0
S245

FIG. 25

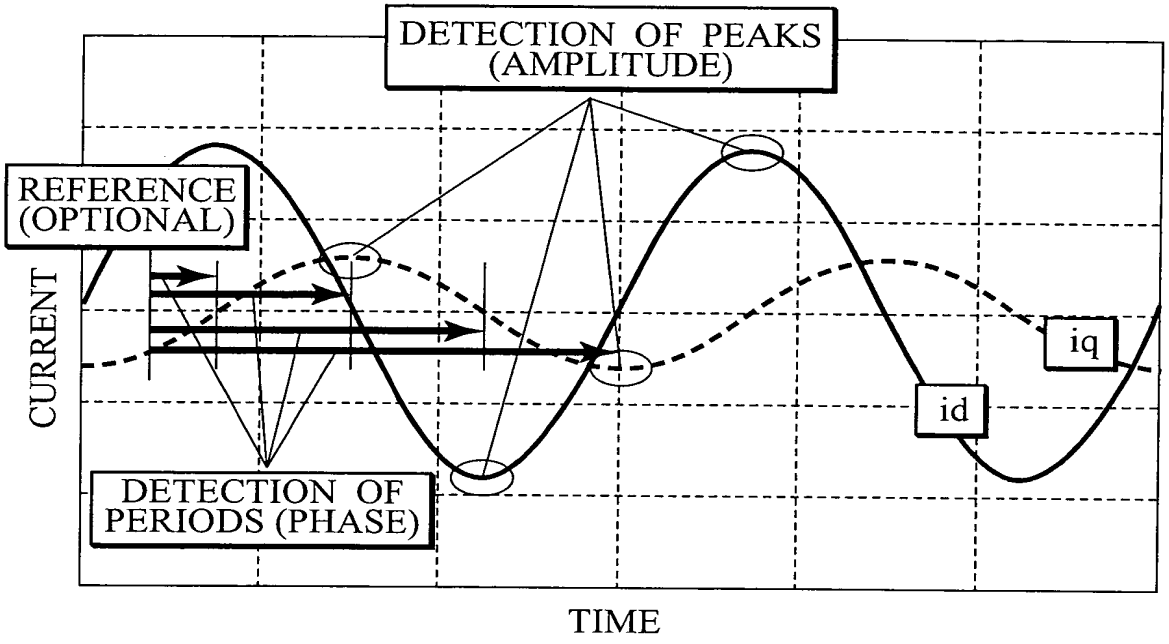

DETECTION OF PEAKS
(AMPLITUDE)
REFERENCE
(OPTIONAL)
CURRENT
iq
id
DETECTION OF
PERIODS (PHASE)
TIME

FIG. 26

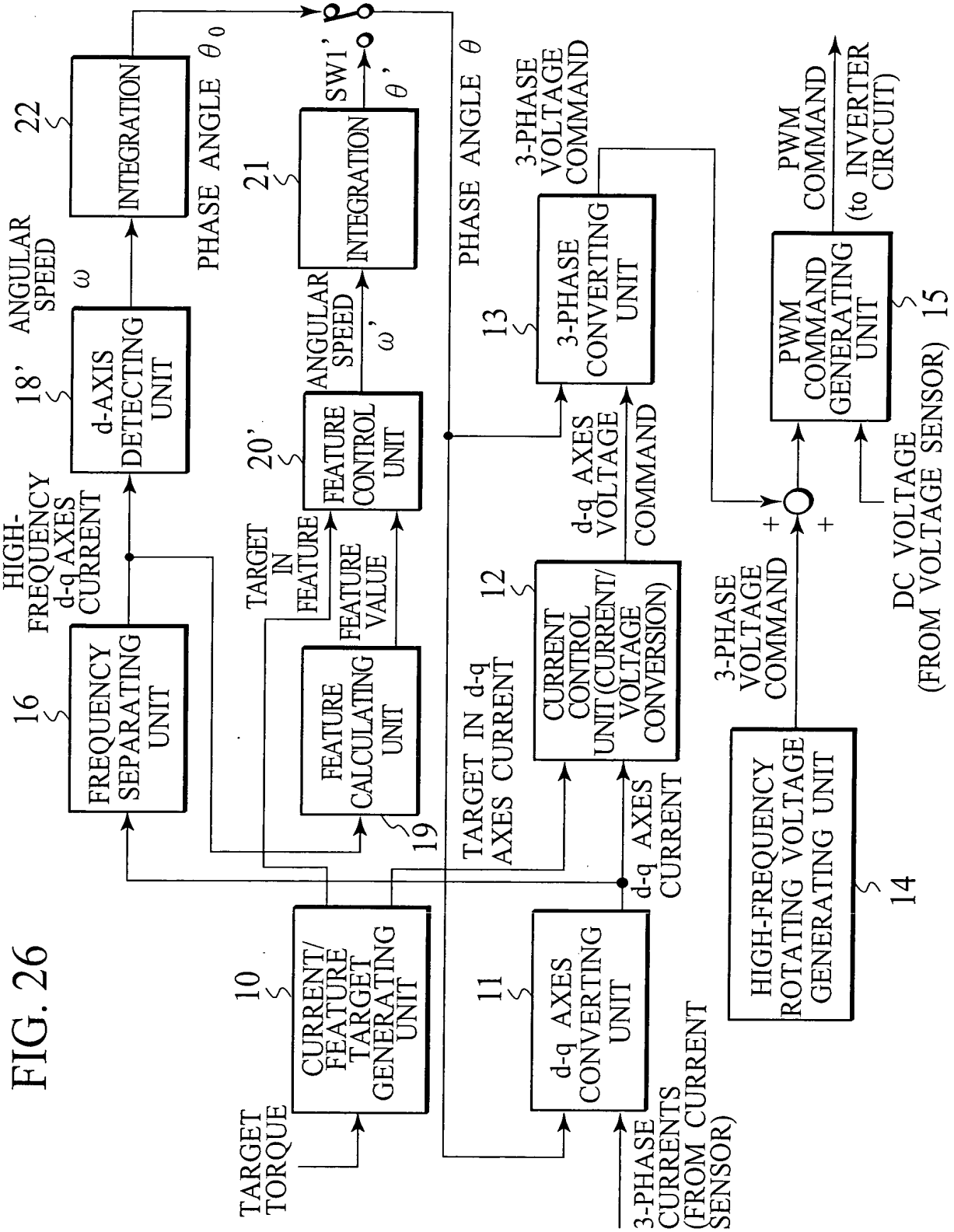

TARGET TORQUE
3-PHASE CURRENTS (FROM CURRENT SENSOR)
DC VOLTAGE (FROM VOLTAGE SENSOR)
10 CURRENT/ FEATURE TARGET GENERATING UNIT
11 d-q AXES CONVERTING UNIT
12 CURRENT CONTROL UNIT (CURRENT/ VOLTAGE CONVERSION)
13 3-PHASE CONVERTING UNIT
14 HIGH-FREQUENCY ROTATING VOLTAGE GENERATING UNIT
15 PWM COMMAND GENERATING UNIT
16 FREQUENCY SEPARATING UNIT
18' d-AXIS DETECTING UNIT
19 FEATURE CALCULATING UNIT
20' FEATURE CONTROL UNIT
21 INTEGRATION
22 INTEGRATION
SW1'
TARGET IN d-q AXES CURRENT
d-q AXES CURRENT
d-q AXES VOLTAGE COMMAND
3-PHASE VOLTAGE COMMAND
PWM COMMAND (to INVERTER CIRCUIT)
HIGH-FREQUENCY d-q AXES CURRENT
TARGET IN FEATURE
FEATURE VALUE
ANGULAR SPEED ω
ANGULAR SPEED ω'
PHASE ANGLE θ0
PHASE ANGLE θ
θ'
+
+

FIG. 27

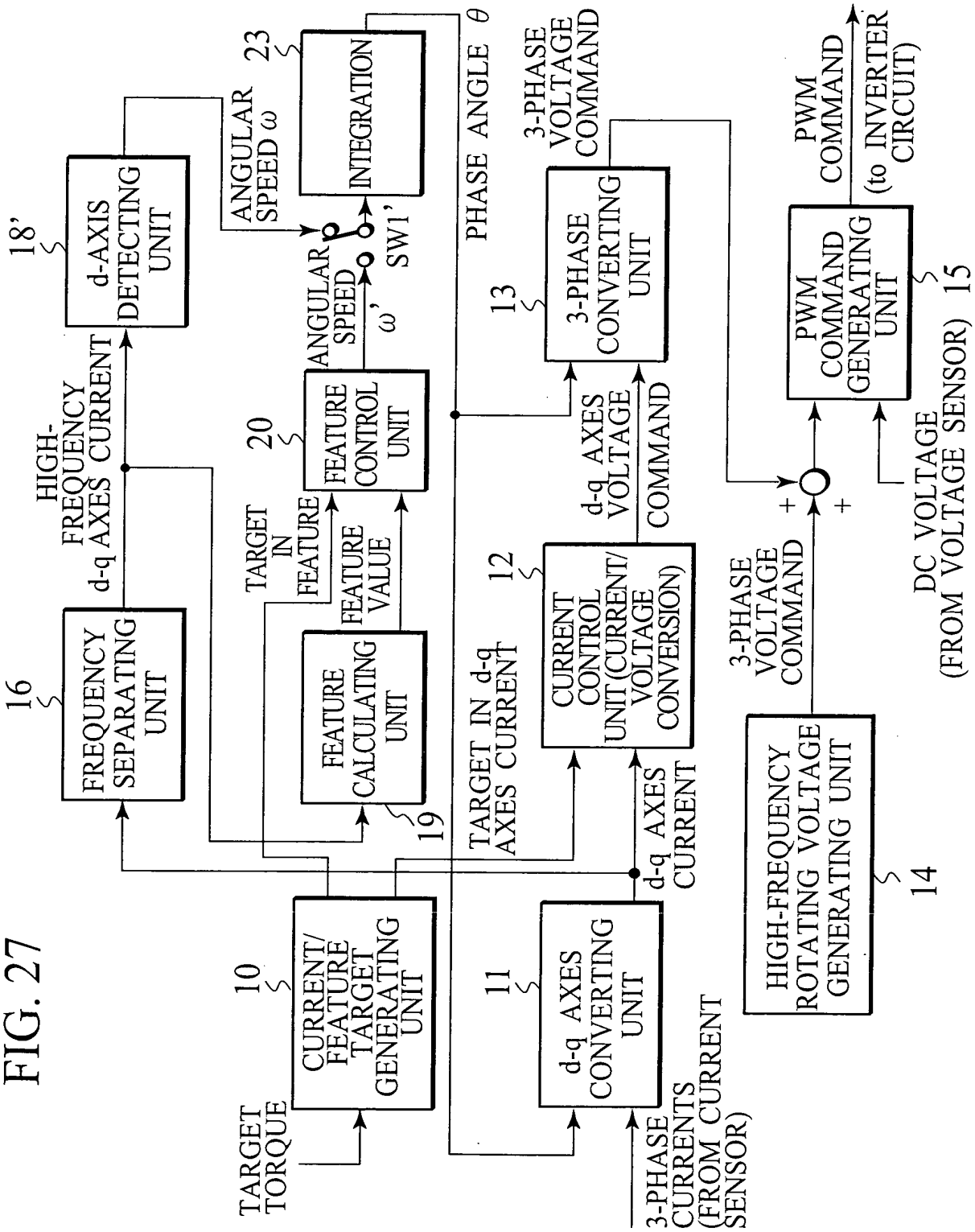

TARGET TORQUE
CURRENT/ FEATURE TARGET GENERATING UNIT
10
3-PHASE CURRENTS (FROM CURRENT SENSOR)
d-q AXES CONVERTING UNIT
11
d-q AXES CURRENT
TARGET IN d-q AXES CURRENT
CURRENT CONTROL UNIT (CURRENT/ VOLTAGE CONVERSION)
12
d-q AXES VOLTAGE COMMAND
3-PHASE CONVERTING UNIT
13
3-PHASE VOLTAGE COMMAND
HIGH-FREQUENCY ROTATING VOLTAGE GENERATING UNIT
14
3-PHASE VOLTAGE COMMAND
DC VOLTAGE (FROM VOLTAGE SENSOR)
PWM COMMAND GENERATING UNIT
15
PWM COMMAND (to INVERTER CIRCUIT)
FREQUENCY SEPARATING UNIT
16
HIGH-FREQUENCY d-q AXES CURRENT
d-AXIS DETECTING UNIT
18'
FEATURE CALCULATING UNIT
19
FEATURE VALUE
TARGET IN FEATURE
FEATURE CONTROL UNIT
20
ANGULAR SPEED ω'
SW1'
ANGULAR SPEED ω
INTEGRATION
23
PHASE ANGLE θ

FIG. 28

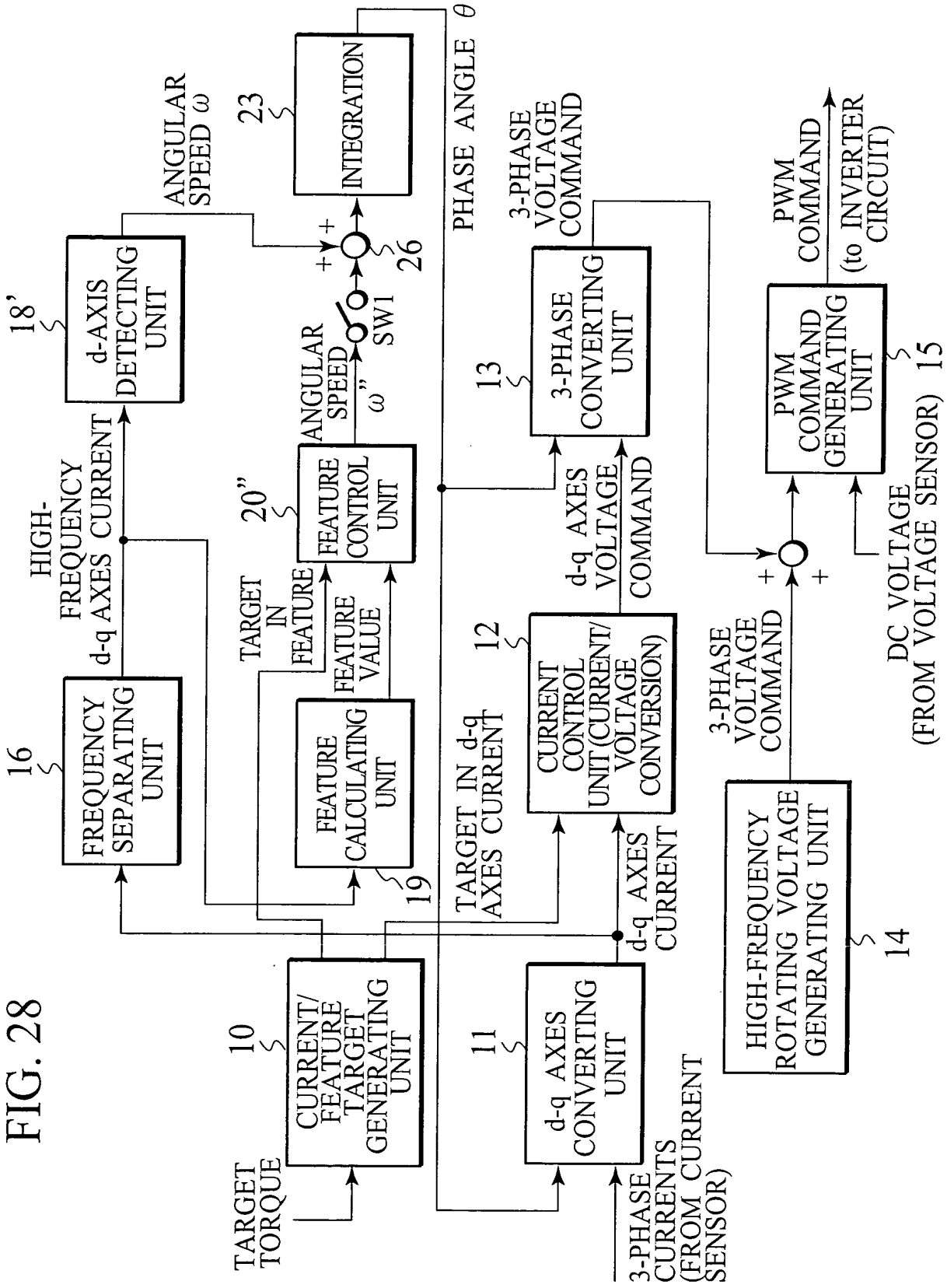

TARGET TORQUE
CURRENT/ FEATURE TARGET GENERATING UNIT
10
3-PHASE CURRENTS (FROM CURRENT SENSOR)
d-q AXES CONVERTING UNIT
11
d-q AXES CURRENT
TARGET IN d-q AXES CURRENT
CURRENT CONTROL UNIT (CURRENT/ VOLTAGE CONVERSION)
12
d-q AXES VOLTAGE COMMAND
3-PHASE CONVERTING UNIT
13
3-PHASE VOLTAGE COMMAND
HIGH-FREQUENCY ROTATING VOLTAGE GENERATING UNIT
14
DC VOLTAGE (FROM VOLTAGE SENSOR)
PWM COMMAND GENERATING UNIT
15
PWM COMMAND (to INVERTER CIRCUIT)
FREQUENCY SEPARATING UNIT
16
HIGH-FREQUENCY d-q AXES CURRENT
d-AXIS DETECTING UNIT
18'
ANGULAR SPEED ω
INTEGRATION
23
PHASE ANGLE θ
SW1
26
ANGULAR SPEED ω"
FEATURE CONTROL UNIT
20"
TARGET IN FEATURE
FEATURE VALUE
FEATURE CALCULATING UNIT
19

FIG. 29

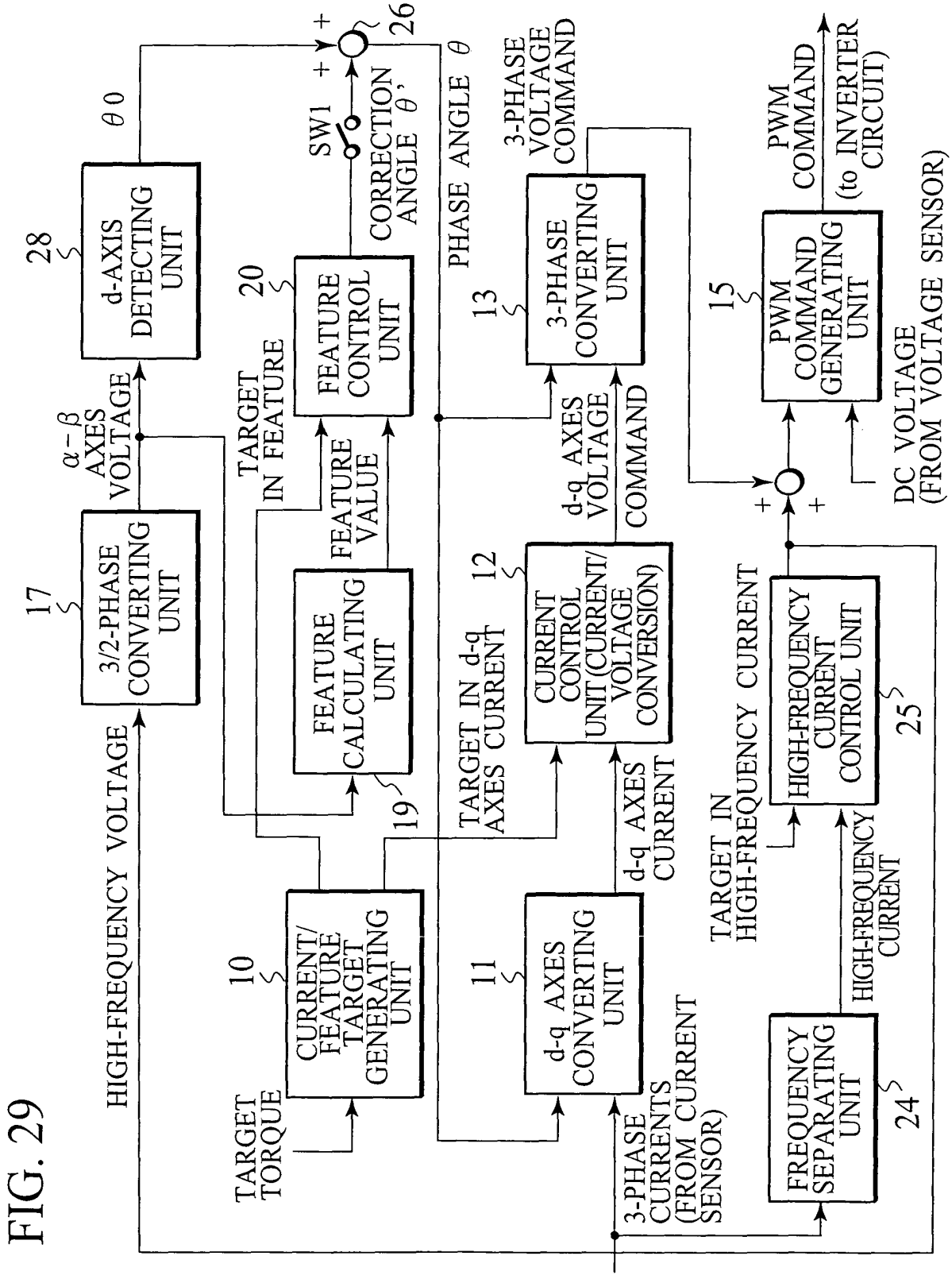

HIGH-FREQUENCY VOLTAGE
17
3/2-PHASE CONVERTING UNIT
α-β AXES VOLTAGE
28
d-AXIS DETECTING UNIT
θ0
TARGET TORQUE
10
CURRENT/ FEATURE TARGET GENERATING UNIT
FEATURE CALCULATING UNIT
19
TARGET IN FEATURE
FEATURE VALUE
20
FEATURE CONTROL UNIT
SW1
CORRECTION ANGLE θ'
26
PHASE ANGLE θ
3-PHASE CURRENTS (FROM CURRENT SENSOR)
11
d-q AXES CONVERTING UNIT
d-q AXES CURRENT
TARGET IN d-q AXES CURRENT
12
CURRENT CONTROL UNIT (CURRENT/ VOLTAGE CONVERSION)
d-q AXES VOLTAGE COMMAND
13
3-PHASE CONVERTING UNIT
3-PHASE VOLTAGE COMMAND
TARGET IN HIGH-FREQUENCY CURRENT
FREQUENCY SEPARATING UNIT
24
HIGH-FREQUENCY CURRENT
HIGH-FREQUENCY CURRENT CONTROL UNIT
25
15
PWM COMMAND GENERATING UNIT
PWM COMMAND
(to INVERTER CIRCUIT)
DC VOLTAGE (FROM VOLTAGE SENSOR)

FIG. 30B

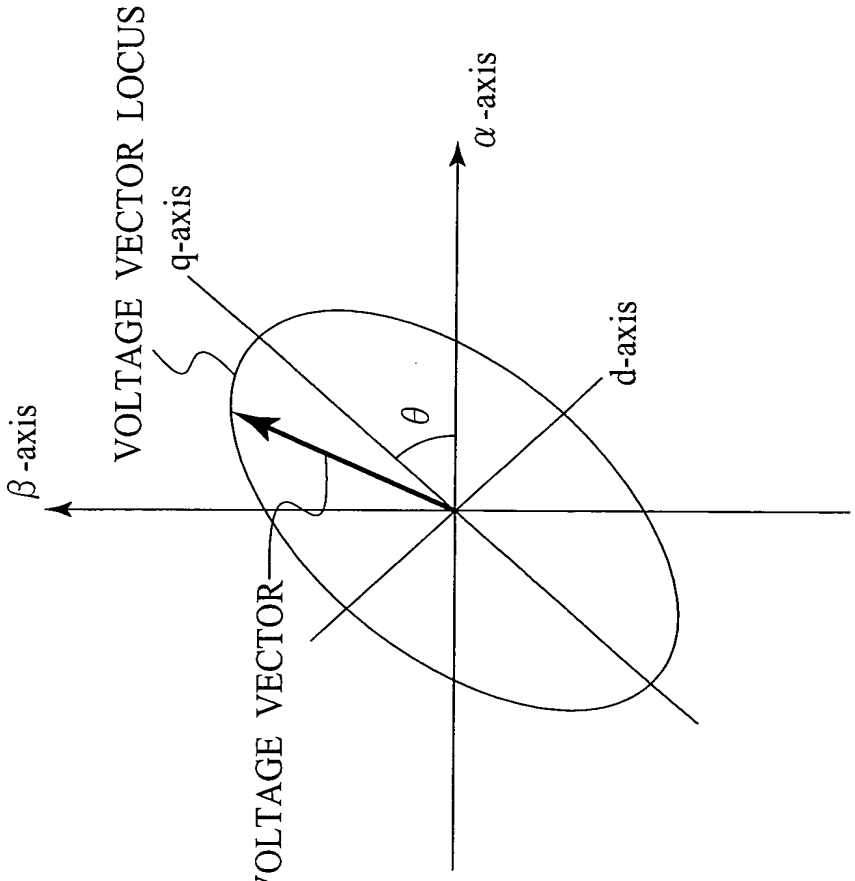


FIG. 30A

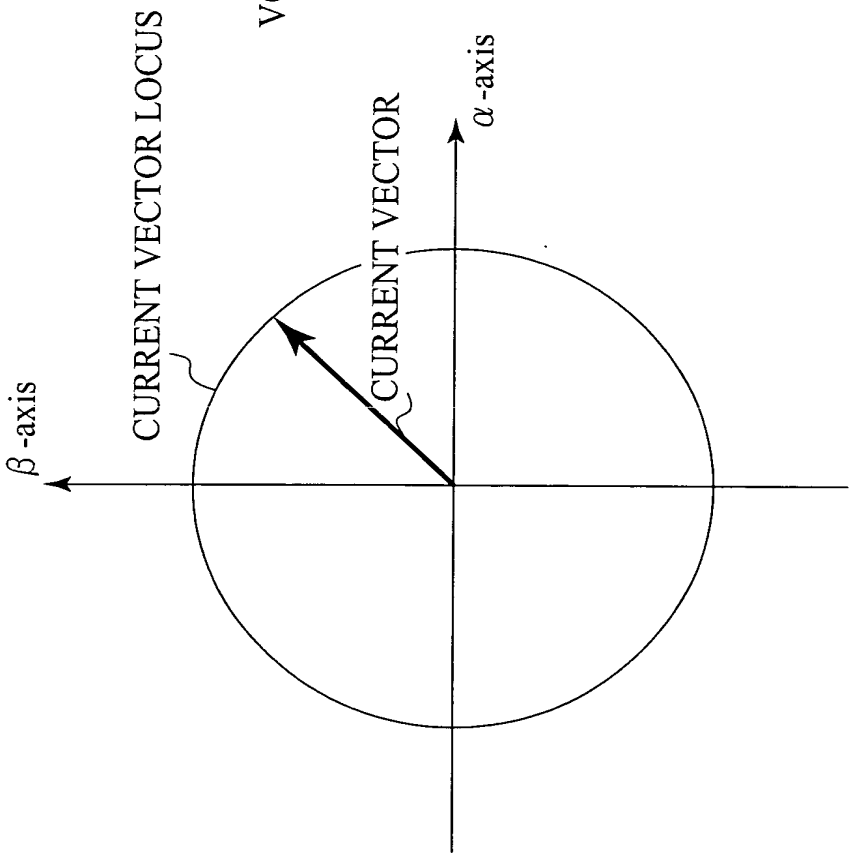


FIG. 31

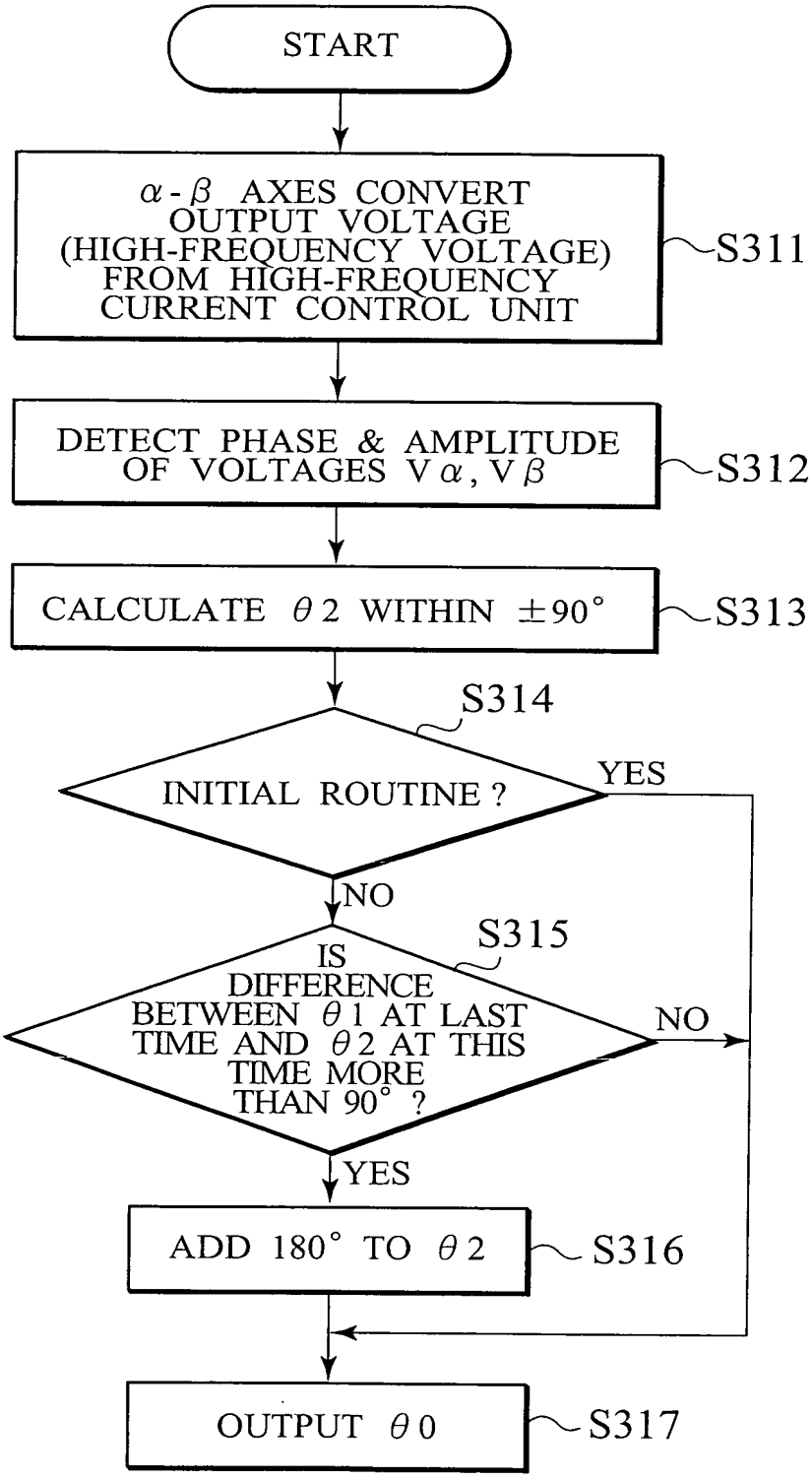

START
α-β AXES CONVERT OUTPUT VOLTAGE (HIGH-FREQUENCY VOLTAGE) FROM HIGH-FREQUENCY CURRENT CONTROL UNIT
S311
DETECT PHASE & AMPLITUDE OF VOLTAGES Vα, Vβ
S312
CALCULATE θ2 WITHIN ±90°
S313
S314
INITIAL ROUTINE ?
YES
NO
S315
IS DIFFERENCE BETWEEN θ1 AT LAST TIME AND θ2 AT THIS TIME MORE THAN 90° ?
NO
YES
ADD 180° TO θ2
S316
OUTPUT θ0
S317

FIG. 32

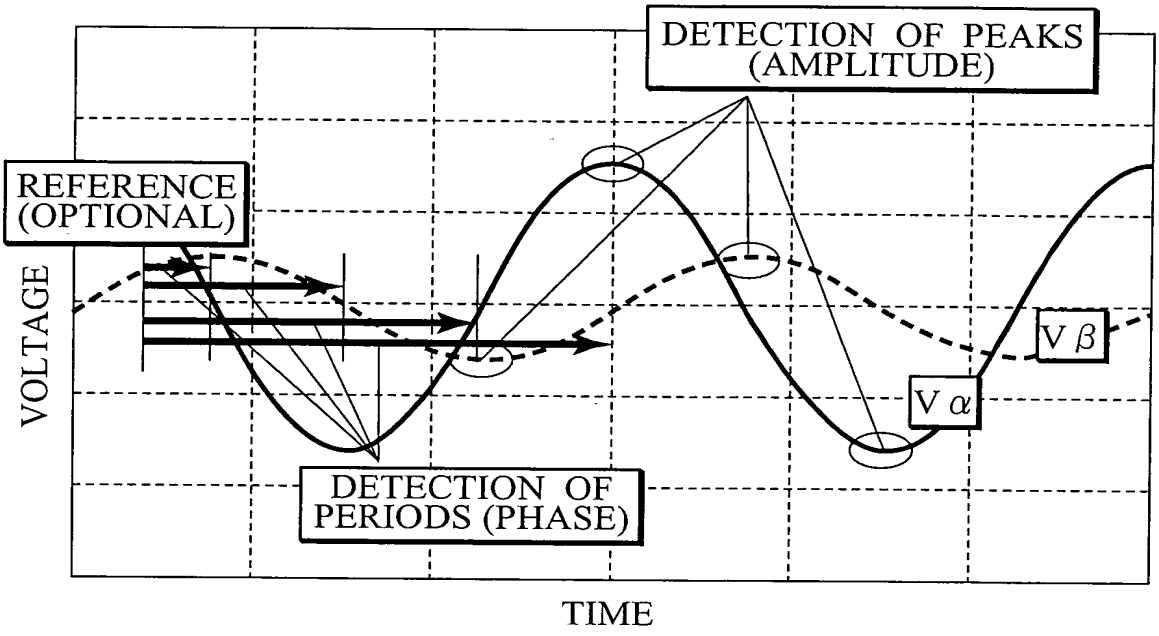

DETECTION OF PEAKS
(AMPLITUDE)
REFERENCE
(OPTIONAL)
VOLTAGE
V β
V α
DETECTION OF
PERIODS (PHASE)
TIME

FIG. 33

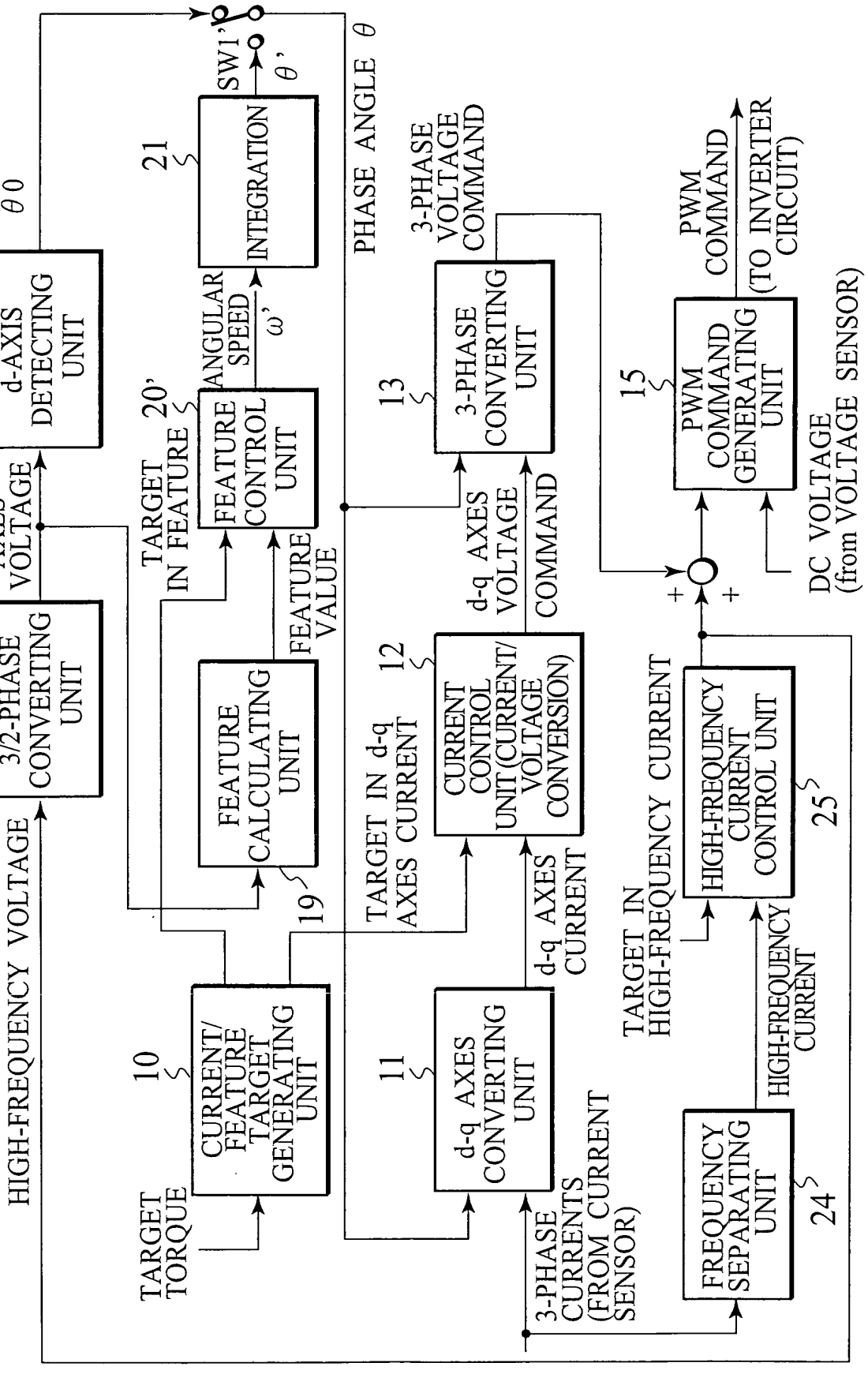

HIGH-FREQUENCY VOLTAGE
17
3/2-PHASE CONVERTING UNIT
α-β AXES VOLTAGE
28
d-AXIS DETECTING UNIT
θ0
SW1'
θ'
21
INTEGRATION
ANGULAR SPEED
ω'
PHASE ANGLE θ
TARGET IN FEATURE
20'
FEATURE CONTROL UNIT
FEATURE VALUE
19
FEATURE CALCULATING UNIT
TARGET TORQUE
10
CURRENT/ FEATURE TARGET GENERATING UNIT
TARGET IN d-q AXES CURRENT
12
CURRENT CONTROL UNIT(CURRENT/ VOLTAGE CONVERSION)
d-q AXES VOLTAGE COMMAND
13
3-PHASE CONVERTING UNIT
3-PHASE VOLTAGE COMMAND
11
d-q AXES CONVERTING UNIT
d-q AXES CURRENT
3-PHASE CURRENTS (FROM CURRENT SENSOR)
TARGET IN HIGH-FREQUENCY CURRENT
15
PWM COMMAND GENERATING UNIT
PWM COMMAND (TO INVERTER CIRCUIT)
DC VOLTAGE (from VOLTAGE SENSOR)
HIGH-FREQUENCY CURRENT CONTROL UNIT
25
HIGH-FREQUENCY CURRENT
FREQUENCY SEPARATING UNIT
24

FIG. 34

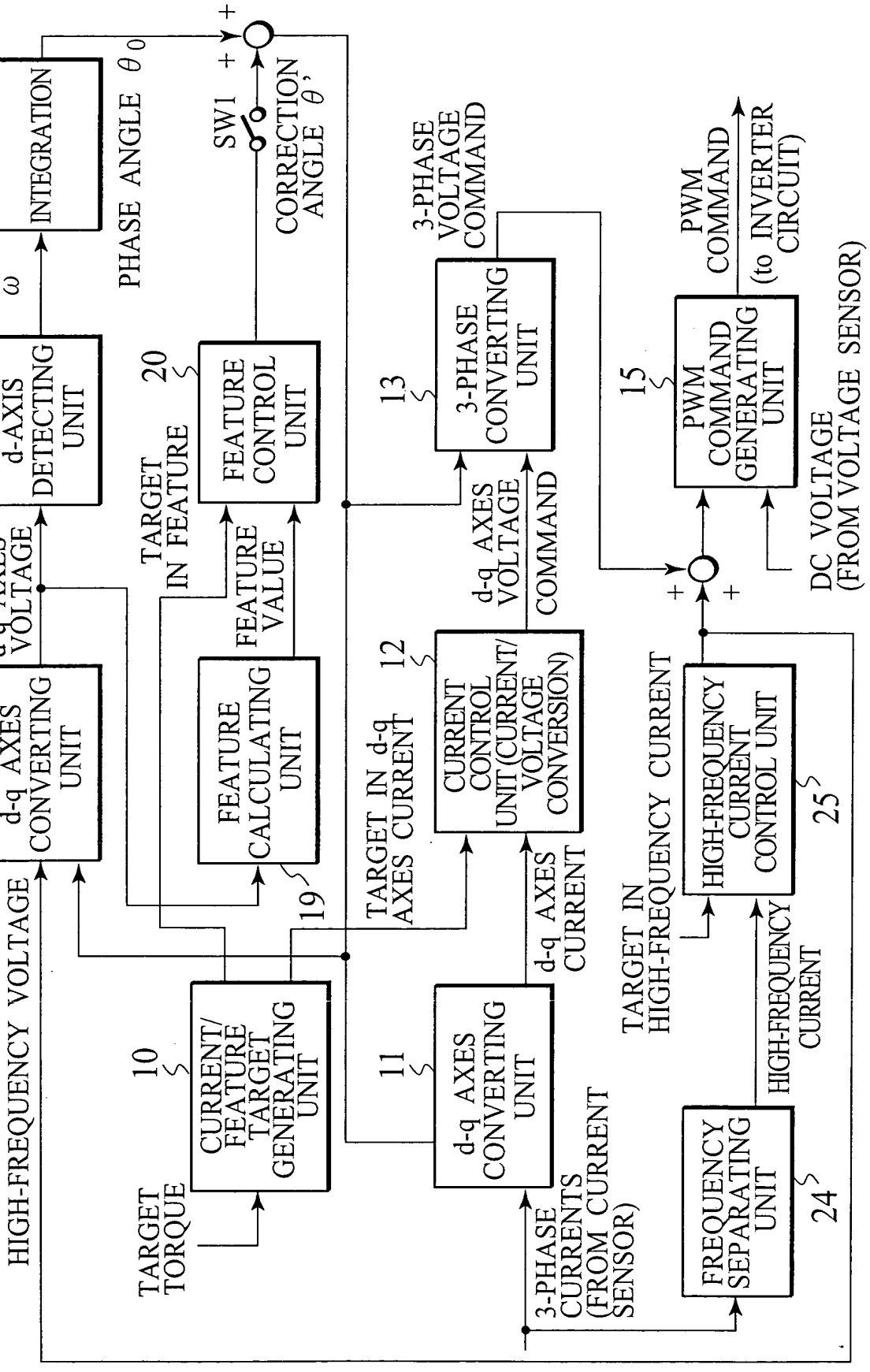

HIGH-FREQUENCY VOLTAGE
TARGET TORQUE
CURRENT/ FEATURE TARGET GENERATING UNIT
10
d-q AXES CONVERTING UNIT
27
d-q AXES VOLTAGE
d-AXIS DETECTING UNIT
28'
ANGULAR SPEED ω
INTEGRATION
22
PHASE ANGLE θ0
SW1
CORRECTION ANGLE θ'
FEATURE CALCULATING UNIT
19
FEATURE VALUE
TARGET IN FEATURE
FEATURE CONTROL UNIT
20
3-PHASE CURRENTS (FROM CURRENT SENSOR)
d-q AXES CONVERTING UNIT
11
TARGET IN d-q AXES CURRENT
CURRENT CONTROL UNIT (CURRENT/ VOLTAGE CONVERSION)
12
d-q AXES CURRENT
d-q AXES VOLTAGE COMMAND
3-PHASE CONVERTING UNIT
13
3-PHASE VOLTAGE COMMAND
FREQUENCY SEPARATING UNIT
24
HIGH-FREQUENCY CURRENT
TARGET IN HIGH-FREQUENCY CURRENT
HIGH-FREQUENCY CURRENT CONTROL UNIT
25
PWM COMMAND GENERATING UNIT
15
PWM COMMAND (to INVERTER CIRCUIT)
DC VOLTAGE (FROM VOLTAGE SENSOR)

FIG. 35

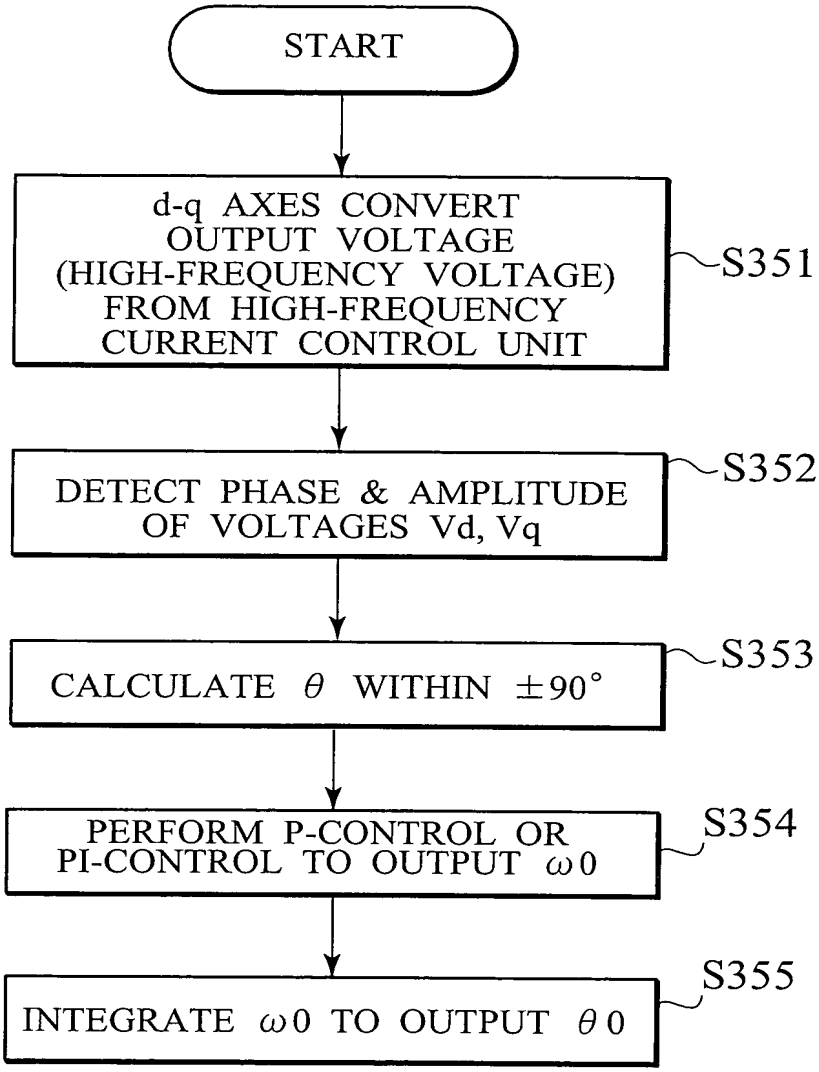

START
d-q AXES CONVERT OUTPUT VOLTAGE (HIGH-FREQUENCY VOLTAGE) FROM HIGH-FREQUENCY CURRENT CONTROL UNIT
S351
DETECT PHASE & AMPLITUDE OF VOLTAGES Vd, Vq
S352
CALCULATE θ WITHIN ±90°
S353
PERFORM P-CONTROL OR PI-CONTROL TO OUTPUT ω0
S354
INTEGRATE ω0 TO OUTPUT θ0
S355

FIG. 36

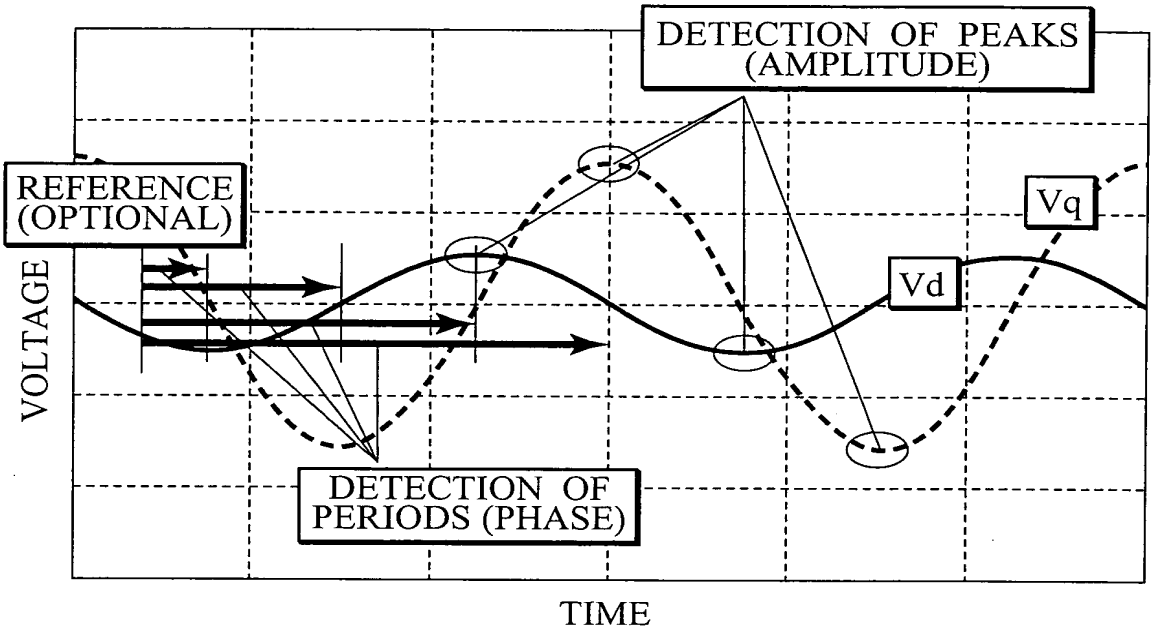

DETECTION OF PEAKS
(AMPLITUDE)
REFERENCE
(OPTIONAL)
Vq
Vd
VOLTAGE
DETECTION OF
PERIODS (PHASE)
TIME

FIG. 37

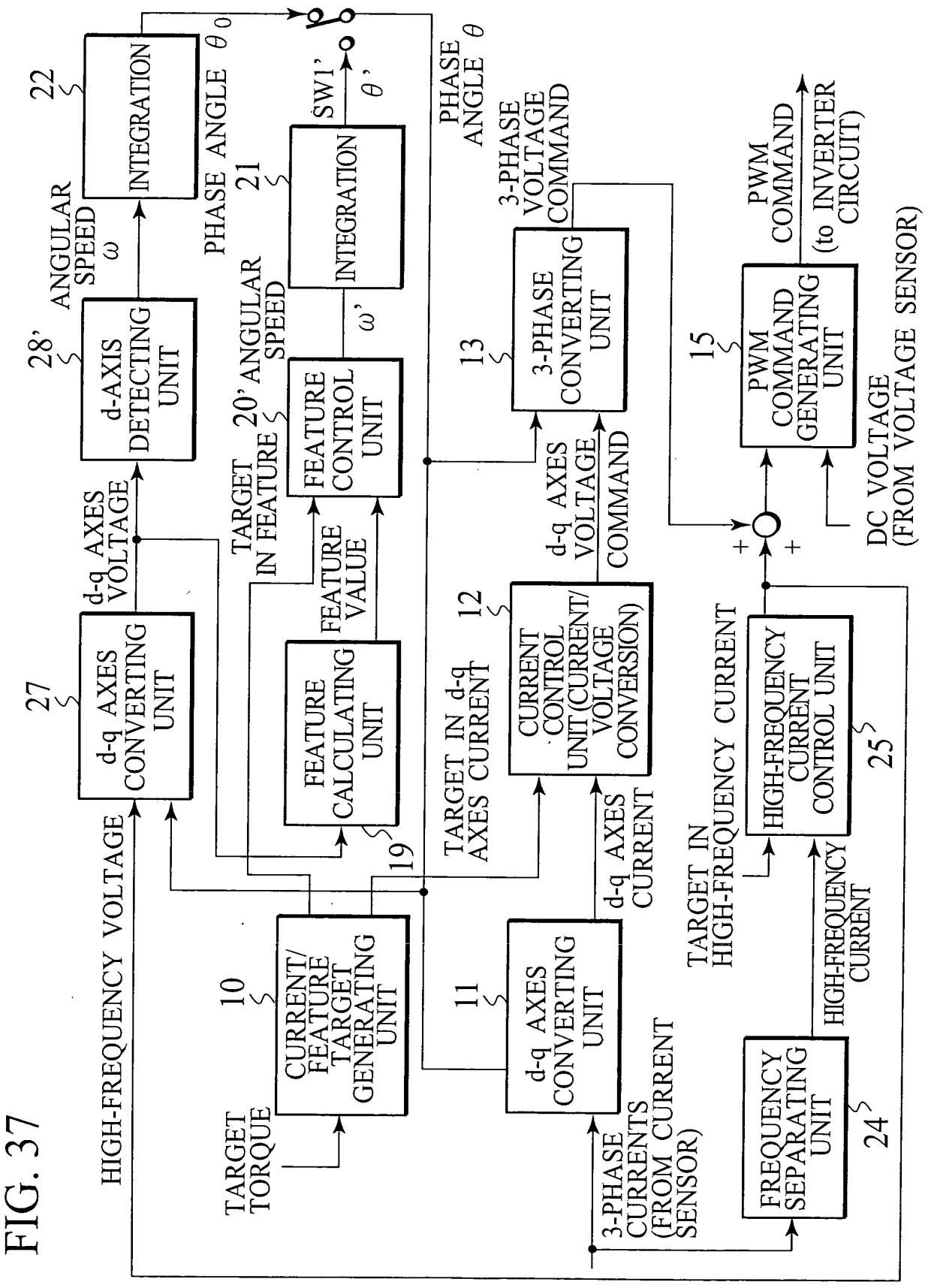

HIGH-FREQUENCY VOLTAGE
TARGET TORQUE
CURRENT/ FEATURE TARGET GENERATING UNIT
10
d-q AXES CONVERTING UNIT
27
d-q AXES VOLTAGE
d-AXIS DETECTING UNIT
28'
ANGULAR SPEED ω
INTEGRATION
22
PHASE ANGLE θ0
FEATURE CALCULATING UNIT
19
FEATURE VALUE
TARGET IN FEATURE
FEATURE CONTROL UNIT
20'
ANGULAR SPEED
ω'
INTEGRATION
21
SW1'
θ'
PHASE ANGLE θ
TARGET IN d-q AXES CURRENT
CURRENT CONTROL UNIT(CURRENT/ VOLTAGE CONVERSION)
12
d-q AXES VOLTAGE COMMAND
3-PHASE CONVERTING UNIT
13
3-PHASE VOLTAGE COMMAND
3-PHASE CURRENTS (FROM CURRENT SENSOR)
d-q AXES CONVERTING UNIT
11
d-q AXES CURRENT
TARGET IN HIGH-FREQUENCY CURRENT
HIGH-FREQUENCY CURRENT CONTROL UNIT
25
HIGH-FREQUENCY CURRENT
FREQUENCY SEPARATING UNIT
24
PWM COMMAND GENERATING UNIT
15
PWM COMMAND
(to INVERTER CIRCUIT)
DC VOLTAGE (FROM VOLTAGE SENSOR)
+
+

FIG. 38

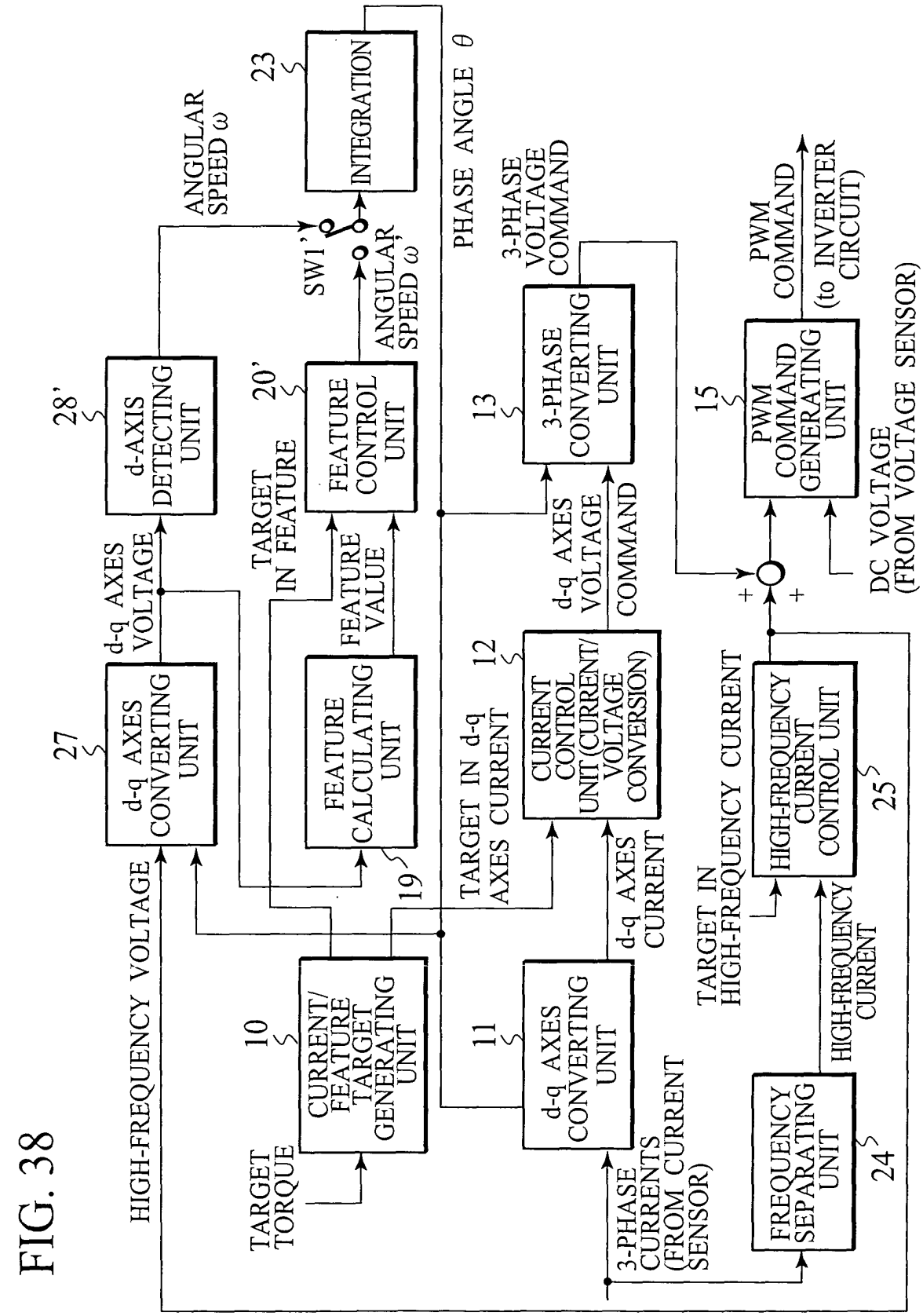
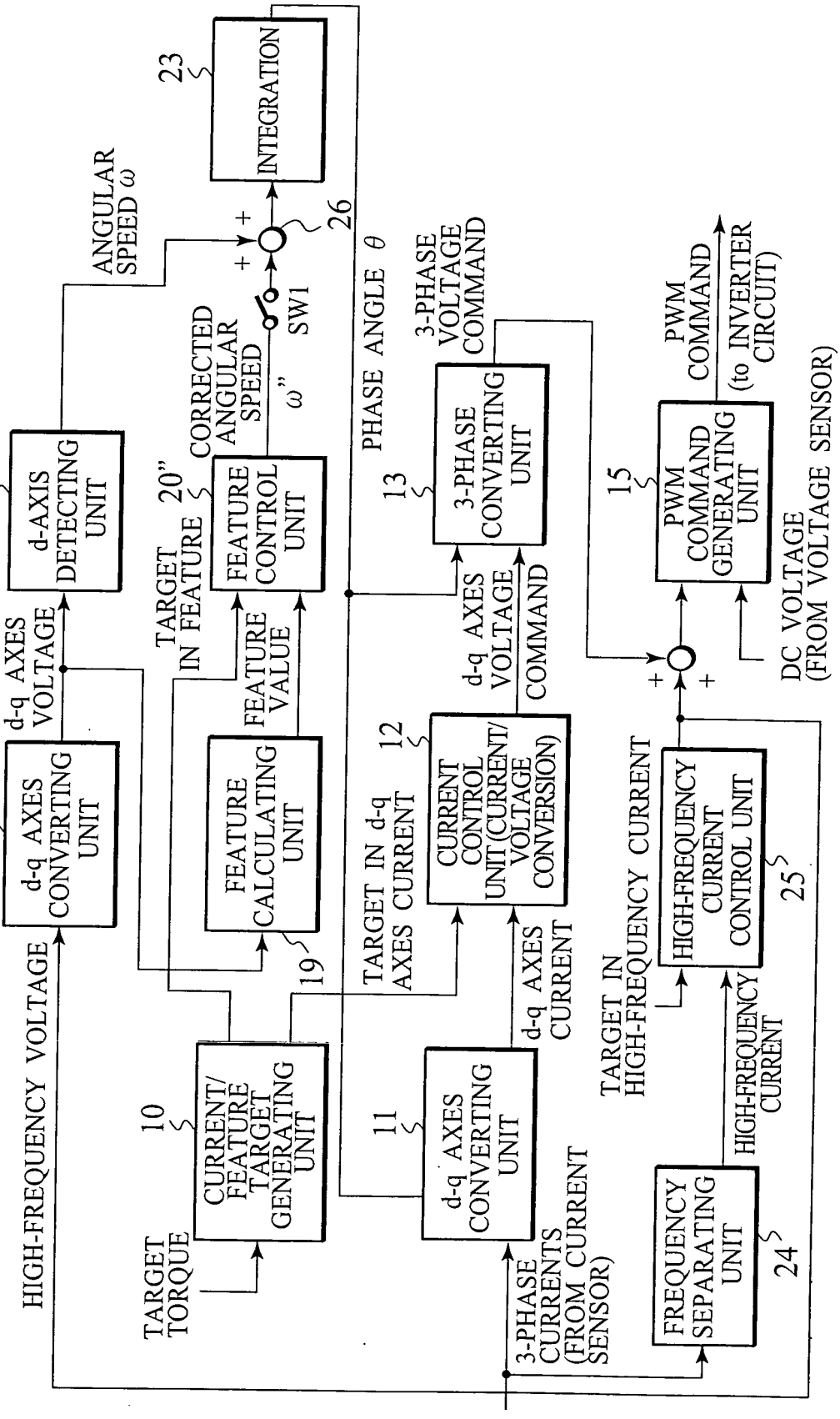

HIGH-FREQUENCY VOLTAGE
TARGET TORQUE
CURRENT/ FEATURE TARGET GENERATING UNIT
10
d-q AXES CONVERTING UNIT
27
d-q AXES VOLTAGE
d-AXIS DETECTING UNIT
28'
ANGULAR SPEED ω
INTEGRATION
23
PHASE ANGLE θ
SW1'
ANGULAR SPEED ω'
TARGET IN FEATURE
FEATURE CONTROL UNIT
20'
FEATURE VALUE
FEATURE CALCULATING UNIT
19
TARGET IN d-q AXES CURRENT
CURRENT CONTROL UNIT (CURRENT/ VOLTAGE CONVERSION)
12
d-q AXES VOLTAGE COMMAND
3-PHASE CONVERTING UNIT
13
3-PHASE VOLTAGE COMMAND
PWM COMMAND GENERATING UNIT
15
PWM COMMAND (to INVERTER CIRCUIT)
DC VOLTAGE (FROM VOLTAGE SENSOR)
+
+
TARGET IN HIGH-FREQUENCY CURRENT
HIGH-FREQUENCY CURRENT CONTROL UNIT
25
HIGH-FREQUENCY CURRENT
FREQUENCY SEPARATING UNIT
24
d-q AXES CONVERTING UNIT
11
d-q AXES CURRENT
3-PHASE CURRENTS (FROM CURRENT SENSOR)

FIG. 39


HIGH-FREQUENCY VOLTAGE
TARGET TORQUE
3-PHASE CURRENTS (FROM CURRENT SENSOR)
DC VOLTAGE (FROM VOLTAGE SENSOR)
10
CURRENT/ FEATURE TARGET GENERATING UNIT
11
d-q AXES CONVERTING UNIT
12
CURRENT CONTROL UNIT (CURRENT/ VOLTAGE CONVERSION)
13
3-PHASE CONVERTING UNIT
15
PWM COMMAND GENERATING UNIT
19
FEATURE CALCULATING UNIT
20"
FEATURE CONTROL UNIT
23
INTEGRATION
24
FREQUENCY SEPARATING UNIT
25
HIGH-FREQUENCY CURRENT CONTROL UNIT
26
SW1
27
d-q AXES CONVERTING UNIT
28'
d-AXIS DETECTING UNIT
TARGET IN d-q AXES CURRENT
d-q AXES CURRENT
d-q AXES VOLTAGE COMMAND
3-PHASE VOLTAGE COMMAND
PWM COMMAND (to INVERTER CIRCUIT)
TARGET IN HIGH-FREQUENCY CURRENT
HIGH-FREQUENCY CURRENT
d-q AXES VOLTAGE
FEATURE VALUE
TARGET IN FEATURE
CORRECTED ANGULAR SPEED ω"
ANGULAR SPEED ω
PHASE ANGLE θ